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AUTHOR Piggford, Roland R.: And Others
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ABSTRACT

This survey presenting raw data for the planning of resource sharing and other cooperative library activities in Massachusetts focuses on the borrowing and lending characteristics of libraries with regard to nonresident borrowing activity. It is intended to provide up-to-date estimates of such activity, formulate long term solutions to fiscal problems, and expand access potential for library users. Initial examination of sample data shows the feasibility of expansion of the survey to include library and financial data characteristics of heavy lending municipalities and the socioeconomic, library support, and library activity characteristics of heavy borrowing municipalities. Core area definition and analysis reveal the local nature of nonresident borrowing and the limits of statistical analysis, which indicate that local librarians must now determine causal factors, and that the Board of Commissioners should support further feasibility studies. It is suggested that accessibility factors and collateral use factors as defined in the study should now be used to further studies at local area levels. Five detailed statements of observations and recommendations stress that further reimbursements should not be made on projections of local data, but should concentrate on heavy lenders and encourage development of their services to extralocal clientele. (BAA)

A SURVEY OF NON-RESIDENT LENDING AND BORROWING ACTIVITY IN MASSACHUSETTS

Roland R. Piggford
Head, Library Information Services

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Massachusetts Board of Library Commissioners
648 Beacon Street
Boston, MA 02215

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Neither a borrower nor a lender be:
For loan oft loses both itself and friend,
And borrowing dulls the edge of husbandry.

--Hamlet, Act 1, sc. 3

A good man sheweth favour and lendeth.

--Psalms, cxii, 5

BACKGROUND INFORMATION

In October 1976, the Massachusetts Board of Library Commissioners authorized its staff to undertake a survey of non-resident borrowing activity in Massachusetts, for the general purposes of:

1) Making up-to-date estimates of statewide non-resident borrowing activity;

2) Providing raw data for an evaluation of the reciprocal borrowing standard in terms of its fairness, relevance, and adequacy, and perhaps formulating long-term solutions to fiscal problems engendered by heavy non-resident use;

3) Providing raw data for the planning of resource sharing and other cooperative activities that would expand even further the access potential of library users. (1)

Accordingly, data were gathered during 8 week-long sampling periods approximately coterminous with calendar year 1977.

After initial examination of complete sample data, it was determined that additional dimensions of analysis were feasible which would broaden the scope of purpose of the survey to include:

4) Determining the municipal library and finance data characteristics of "heavy lending" municipalities;

5) determining the socioeconomic, library support and library activity characteristics of "heavy borrowing" municipalities.

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(1) A Survey Design for Non-Resident Borrowing Activity, Planning and Research Unit, Massachusetts Board of Library Commissioners, October6, 1976. p. 2

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STATEWIDE DATA

STATEWIDE DATA

Based on sample data collected during the 8 week-long sampling periods, statewide non-resident lending activity has been projected at 1,871,376 loans (± 7.8%) for the calendar year 1977.

In narrative terms (applying the appropriate 5% confidence interval):

> We are 95% certain that, based on sample data submitted, statewide volume was between 1,726,036 and 2,016,716 loans for the year, with the mean projection of 1,871,376 being the best estimate of true volume. (p. 4).

Although non-resident loans were reasonably evenly distributed by population group, there were discernable concentrations of activity in population groups VII (over 100,000) and V (25,000 to 49,999) in terms of total volume and per capita volume:

Population Group	Projected Non-Resident Loans	Projected Non-Resident Loans Per Capita
VII. Over 100,000	588,061	.459
VI. 50,000 - 99,999	197,503	.178
V. 25,000 - 49,999	519,596	.407
IV. 10,000 - 24,999	406,939	.295
III. 5,000 - 9,999	97,884	.217
II. 2,000 - 4,999	48,867	.210
I. Under 2,000	12,526	.175

The mean projection of total non-resident loans translates into a per capita figure of .323 while total statewide circulation for the sample year was approximately 6.15 loans per capita. Applying the appropriate confidence interval, we may say that non-resident loans represented between 5% and 6% of total circulation.

The 20 most active non-resident lending communities (total loans) accounted for 62% of total statewide non-resident volume (see page 6). Ten communities ranked among the top 20 in terms of total non-resident loans and non-resident loans per capita:

	Rank (of 20)	
Municipality	Total Loans	Loans Per Capita
Brookline	4	11
Wellesley	5	5

Municipality	(Rank) Total Loans	(Rank) Loans Per Capita
Fitchburg	6	10
Taunton	7	13
Lexington	8	12
Hingham	9	7
Northampton	11	13
Greenfield	12	9
Andover	13	16
Lynnfield	14	4

Concord, with a projected 16,380 non-resident loans for the sample period, undoubtedly would have placed among the leaders had full regionwide participation in the reciprocal borrowing program been in force during the sampling period.

It should also be noted that Hingham ceased participation in the reciprocal borrowing program midway through the survey year, and reinstated fees for non-resident borrowers. Therefore, Hingham's projected annual volume of 37,400 loans most probably underrepresents its true potential as a free non-resident lender.

Ten of the 20 leaders in total loans served by contract as regional or subregional centers during the survey period. Greenfield served as a Western Region Intermediate Reference Center. These 11 libraries accounted for 46% of statewide non-resident volume:

Municipality	% of Statewide NR Volume
Boston	18.6
Worcester	7.7
Springfield	3.7
Wellesley	3.3
Fitchburg	3.0

Municipality*	% of Statewide NR Volume*
Taunton	2.6
Northampton	1.7
Greenfield	1.7
Andover	1.6
Quincy	1.2
Pittsfield	1.1

Non-resident borrowing is more diffused than non-resident lending. The 20 most active non-resident borrowing communities account for only 28% of total statewide volume. No municipality ranks among the top 20 in terms of both total volume and per capita volume (p. 7).

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*Projections (and %) for 3 remaining contracting libraries: Falmouth--14,313 non-resident loans (.8%)
Lowell -- 4,576 non-resident loans (.2%)
New Bedford did not submit data

SUMMARY OF SAMPLE DATA WITH STATEWIDE PROJECTIONS
OF TOTAL NON-RESIDENT LOANS

Loans Reported: Sampling Periods 1 through 8

Population Group	1	2	3	4	5	6	7	8	T
VII-100,000+	10,774	11,309	13,366	11,430	10,328	10,251	10,018	12,993	90,469
VI-50,000-99,999	2,987	4,145	4,940	4,065	3,787	3,836	3,193	3,432	30,385
V-25,000-49,999	8,165	10,565	12,563	9,848	9,539	8,630	10,372	10,256	79,938
IV-10,000-24,999	6,829	7,626	9,878	8,653	7,801	7,936	7,456	6,527	62,606
III-5,000-9,999	1,339	1,819	1,986	1,740	2,302	2,690	1,582	1,601	15,059
II-2,000-4,999	938	1,324	852	672	1,254	822	872	784	7,518
I-under 2,000	190	205	204	116	411	477	167	157	1,927
TOTAL	31,222	36,993	43,789	36,424	35,422	34,642	33,660	35,750	287,902

Sample Period 1= 12/13/76-12/19/76
2= 1/31/77-2/6/77
3= 3/21/77-3/27/77
4= 5/9/77-5/15/77
5= 6/27/77-7/3/77
6= 8/15/77-8/21/77
7= 10/3/77-10/9/77
8= 11/21/77-11/27/77

Projection of Statewide Volume from Sample Data:

Mean of total reported loans for 8 sampling periods= 35,988

Standard Deviation = 3,632.8

Confidence Interval= 2,795

Tolerance = 7.8%

Low Projection = 1,726,036

High Projection = 2,016,716

Mean Projection = 1,871,376

VARIABILITY OF DATA (ALL RETURNS)
BY POPULATION GROUP
(Groups Ranked According to Sample Volume)

Population Group	N	ΣX	$\bar{X}$	σ	CI	T
VII (over 100,000)	8	90,469	11,308	1260.2	970	8.6%
V (25,000 - 49,999)	8	79,938	9,992	1340.1	1031	10.3%
IV (10,000 - 24,999)	8	62,606	7,826	1042.7	802	10.2%
VI (50,000 - 99,999)	8	30,385	3,798	615.9	475	12.5%
III (5,000 - 9,999)	8	15,059	1,882	435.6	327	17.4%
II (2,000 - 4,999)	8	7,538	940	229.4	173	18.4%
I (under 2,000)	8	1,927	241	129.8	100	41.5%

N = Number of Sample Weeks

ΣX = Total of non-resident loans reported during sampling periods

$\bar{X}$ = Sample mean

σ = Standard deviation

CI = Confidence Level

T = Tolerance

TWENTY MOST ACTIVE NON-RESIDENT LENDING COMMUNITIES -- TOTAL LOANS

Rank	Community	Population	Projected NR Loans
1	Boston	637,986	348,972
2	Worcester	172,342	144,976
3	Springfield	168,785	68,484
4	*Brookline	53,150	64,532
5	*Wellesley	26,593	61,744
6	*Fitchburg	39,070	56,992
7	*Taunton	42,148	48,250
8	*Lexington	32,477	38,220
9	*Hingham	19,544	37,400
10	Cambridge	102,095	33,852
11	*Northampton	27,695	31,760
12	*Greenfield	19,087	31,720
13	*Andover	26,050	29,536
14	*Lynnfield	12,009	28,740
15	Salem	38,545	25,740
16	Belmont	27,660	24,128
17	Quincy	91,487	23,296
18	Pittsfield	55,299	21,333
19	Marlborough	30,249	18,980
20	Amherst	22,308	17,888

TWENTY MOST ACTIVE NON-RESIDENT LENDING COMMUNITIES -- PER CAPITA LOANS

Rank	Community	Population	Projected NR Loans Per Cap.
1	Chilmark	401	4.77
2	Tisbury	2,754	4.29
3	Lenox	5,718	2.89
4	*Lynnfield	12,009	2.39
5	*Wellesley	26,593	2.32
6	Topsfield	5,913	1.93
7	*Hingham	19,544	1.91
8	West Tisbury	685	1.88
9	*Greenfield	19,087	1.66
10	*Fitchburg	39,070	1.46
11	*Brookline	53,150	1.21
12	*Lexington	32,477	1.18
13	*Northampton	27,695	1.15
13	*Taunton	42,418	1.15
13	Wellfleet	1,973	1.15
16	*Andover	26,050	1.14
16	Nantucket	5,559	1.14
16	Shelburne	1,976	1.14
19	E. Longmeadow	13,132	1.12
20	Westwood	14,019	1.02

*Municipalities appearing on both lists

TWENTY MOST ACTIVE NON-RESIDENT BORROWING COMMUNITIES -- TOTAL VOLUME

Rank	Community	Population	NR Borrowings --Total Borrowings
1	Boston	637,986	68,939
2	Newton	89,183	58,051
3	Cambridge	102,095	55,434
4	Peabody	45,503	40,502
5	Somerville	80,596	37,700
6	Brookline	53,150	35,945
7	Waltham	56,757	22,991
8	Arlington	50,223	20,241
9	Shrewsbury	21,965	18,051
10	Quincy	91,487	17,589
11	Natick	31,102	15,483
12	Holden	13,629	15,321
13	Longmeadow	16,676	14,911
14	Weston	11,478	14,398
15	Medford	60,702	14,008
16	New Bedford	100,345	13,156
17	Weymouth	56,854	13,137
18	Revere	41,292	12,948
19	Agawam	24,305	12,890
20	Leominster	35,429	12,818

TWENTY MOST ACTIVE NON-RESIDENT BORROWING COMMUNITIES -- PER CAPITA VOLUME

Rank	Community	Population	NR Borrowings -- Per Capita
1	Berkley	2,300	2.640
2	Charlemont	1,050	2.594
3	Stockbridge	2,228	2.564
4	Mashpee	2,496	2.490
5	Ashby	2,348	2.370
6	Dighton	5,076	2.314
7	Boxford	4,565	2.247
8	Cheshire	3,199	2.233
9	Ashfield	1,420	2.133
10	Shelburne	1,976	2.109
11	Rowe	313	2.056
12	New Ashford	160	1.991
13	Cummington	651	1.976
14	Richmond	1,689	1.951
15	Dover	4,923	1.876
16	Bernardston	1,776	1.859
17	Cohasset	7,785	1.854
18	Williamsburg	2,292	1.784
19	Ashburnham	3,834	1.687
20	Paxton	3,706	1.682

LOCAL PROJECTIONS : METHODOLOGY

A total of 288 municipalities reported non-resident loans for a least 1 sample period, and 216 municipalities reported for at least 6 sample periods.

Although all reported data were utilized in developing the preceding aggregate statewide projections, the projections of local volumes were made only for those municipalities submitting data for at-least 6 of the 8 sample periods.

Population Group	No. of Municipalities	No. in Data	% in Data
Over 100,000	6	4	67
50,000 - 99,999	16	14	88
25,000 - 49,999	39	32	82
10,000 - 24,999	87	65	75
5,000 - 9,999	65	42	66
2,000 - 4,999	64	37	58
Under 2,000	74	22	30
Totals	351	216	62% *

*containing 78% of total state population

Mean projections of total volume have been used in all subsequent computations, with appropriate adjustments for seasonal variations.

(See Technical Appendix for additional methodological notes)

NON-RESIDENT LOAN PROJECTIONS

POPULATION: 100,000+

Municipality	N	Σ	$\bar{X}$	σ	CI (±) (.05)	$T = \frac{CI}{\bar{X}}$ (%)	Projected Annual Volume Low	High	Mean	Mean per Capita
Boston	8	53,690	6,711	899.9	693	10.3	312,936	385,008	348,972	.55
Cambridge	3(17)*	1,988	117	28.4	13	11.1				
	4	2,568	642	51.6	76	11.8	29,939	37,765	33,852	.33
Springfield	8	10,539	1,317	250.6	193	14.7	58,448	78,520	68,484	.41
Worcester	8	22,307	2,788	493.1	379	13.6	125,268	164,684	144,976	.84
POPULATION: 50,000-99,999										
Arlington	8	1,096	137	43.0	33	24.1	5,408	8,840	7,124	.14
Brockton	8	2,307	288	84.6	65	22.6	11,596	18,356	14,976	.16
Brookline	8	9,924	1,241	316.8	243	19.6	51,896	77,168	64,532	1.21
Chicopee	8	556	70	22.8	17	24.3	2,756	4,524	3,640	.06
Framingham	8	2,346	293	74.1	20	6.8	14,196	16,276	15,236	.23
Lawrence	7	965	138	38.3	33	23.9	5,460	8,892	7,176	.11
Lowell	6	527	88	26.4	26	29.5	3,224	5,928	4,576	.05
Lynn	8	1,208	151	29.4	23	15.2	6,656	9,048	7,852	.10
Malden	8	1,038	130	36.5	28	21.5	5,304	8,216	6,760	.12
Newton	3	666	35	20.3	9	25.7				
	5	486	97	28.1	32	33.0	5,258	9,516	7,387	.08
Pittsfield	2(12)*	1,196	100	33.0	19	19.0				
	6	2,084	347	57.8	56	16.1	17,667	24,999	21,333	.39

(N=no. of sample wks.; Σ=sum of sample values; $\bar{X}$=sample mean; σ=standard deviation; CI=confidence interval; T=tolerance)

*seasonal projection based on ( ) sample days

NON-RESIDENT LOAN PROJECTIONS

POPULATION: 50,000-99,999

Municipality	N	Σ	$\bar{X}$	σ	CI (±) (.05)	$T = \frac{CI}{\bar{X}}$ (%)	Projected Annual Volume Low	High	Mean	Mean per Capita
Quincy	8	3,583	448	111.5	86	19.2	18,824	27,768	23,296	.25
Waltham	8	208	26	11.2	9	34.6	884	1,820	1,352	.02
Weymouth	8	1,580	198	48.2	37	18.7	8,372	12,220	10,296	.18

(N=no. of sample wks.; Σ=sum of sample values; $\bar{X}$=sample mean; σ=standard deviation; CI=confidence interval; T=tolerance)

NON-RESIDENT LOAN PROJECTIONS

POPULATION: 25,000-49,999

Municipality	N	Σ	$\bar{X}$	σ	CI (±) (.05)	$T = \frac{CI}{\bar{X}}$ (%)	Projected Annual Volume Low	High	Mean	Mean per Capita
Andover	8	4,546	568	100.2	77	13.5	25,532	33,540	29,536	1.14
Attleboro	8	2,051	256	80.7	62	24.2	10,088	16,536	13,312	.41
Barnstable	8	1,962	245	29.7	23	9.4	11,544	13,936	12,740	.48
Belmont	8	3,715	464	89.2	69	14.9	20,540	27,716	24,128	.87
Beverly	7	1,201	172	47.6	41	23.8	6,812	11,076	8,944	.24
Chelsea	8	1,374	172	64.0	49	28.5	6,395	11,492	8,944	.36
Danvers	8	2,373	297	78.0	60	20.2	12,324	18,564	15,444	.62
Dedham	8	596	75	21.5	17	22.7	3,016	4,784	3,900	.15
Everett	8	422	53	32.0	25	42.2	1,456	4,056	2,756	.07
Fitchburg	8	8,769	1,096	209.8	161	14.7	48,620	65,364	56,992	1.46
Gloucester	8	1,478	185	37.5	29	15.7	8,112	11,128	9,620	.35
Haverill	8	465	58	23.8	18	31.0	2,080	3,952	3,016	.07
Leominster	8	753	94	22.4	17	18.1	4,004	5,772	4,888	.14
Lexington	8	5,878	735	127.2	98	13.3	33,124	43,316	38,220	1.18
Marlboro	8	2,918	365	49.7	38	10.4	17,004	20,956	18,980	.63
Melrose	8	2,076	260	48.3	37	14.2	11,596	15,444	13,520	.42
Milton	8	867	108	39.4	30	27.8	4,056	7,176	5,616	.21

(N=no. of sample wks.; Σ=sum of sample values; $\bar{X}$=sample mean; σ=standard deviation; CI=confidence interval; T=tolerance)

POPULATION: 25,000-49,999

NON-RESIDENT LOAN PROJECTIONS

Municipality	N	Σ	$\bar{X}$	σ	CI (±) (.05)	$T = \frac{CI}{\bar{X}}$ (%)	Projected Annual Volume Low	High	Mean	Mean per Capita
Natick	8	151	19	12.1	9	47.4	520	1,456	988	.03
Needham	6	1,771	295	62.1	61	20.7	12,168	18,512	15,340	.51
Northampton	1(7)*	905	129	36.6	14	10.9				
	7	3,986	569	116.0	43	7.6	29,166	34,353	31,760	1.15
Norwood	7	1,012	145	53.4	45	31.0	5,200	9,880	7,540	.24
Plymouth	2(12)*	1,290	107	36.7	19	17.8				
	6	1,047	175	49.7	48	27.4	11,817	18,525	15,171	.56
Randolph	8	483	60	17.5	13	21.7	2,444	3,796	3,120	.11
Salem	8	3,959	495	77.7	60	12.1	22,620	28,860	25,740	.67
Stoughton	3(17)*	892	52	28.8	14	26.9				
	4	671	168	12.5	19	11.3	9,041	13,371	11,206	.44
Taunton	2(11)*	1,115								
	6	6,315	101	43.0	27	26.7				
			1,052	219.7	201	19.1	38,481	58,019	48,250	1.15
Wakefield	8	1,434	179	32.9	25	14.0	8,008	10,608	9,308	.36
Watertown	8	1,351	169	29.8	23	13.6	7,592	9,984	8,788	.24
Wellesley	1(7)*	1,767	252	100.6	37	14.7				
	6	6,631	1105	208.2	204	18.5	50,779	72,709	61,744	2.32
W. Springfield	8	1,071	134	29.0	22	16.4	5,824	8,112	6,968	.25
Westfield	8	2,386	298	68.7	59	19.8	12,428	18,564	15,496	.47
Woburn	8	265	33	10.5	8	24.2	1,300	2,132	1,716	.05

(N=no. of sample wks.; Σ=sum of sample values; $\bar{X}$=sample mean; σ=standard deviation; CI=confidence interval; T=tolerance)

*seasonal projection based on ( ) sample days

POPULATION: 10,000-24,999

NON-RESIDENT LOAN PROJECTIONS

Municipality	N	Σ	$\bar{X}$	σ	CI (±) (.05)	$T = \frac{CI}{\bar{X}}$ (%)	Projected Annual Volume Low	High	Mean	Mean per Capita
Acton	7	1,129	161	30.2	26	16.1	7,020	9,724	8,372	.46
Adams	8	1,151	144	35.0	27	18.8	6,084	8,892	7,488	.66
Amesbury	2(12)*	19	2	1.9	1	50.0				
	5	156	31	6.8	8	25.8	897	1,521	1,365	.10
Amherst	8	2,755	344	40.9	31	9.0	16,276	19,500	17,888	.80
Athol	6	512	85	26.5	26	30.6	3,068	5,772	4,420	.41
Auburn	8	1,369	171	37.0	28	16.4	7,436	10,348	8,892	.57
Bedford	8	456	57	18.2	14	24.6	2,236	3,692	2,964	.24
Bridgewater	8	330	41	10.1	8	19.5	1,716	2,548	2,132	.16
Burlington	8	664	83	13.5	10	12.0	3,796	4,836	4,316	.18
Concord	7	2,206	315	70.9	61	19.4	13,208	19,552	16,380	.95
Dartmouth	8	1,744	218	37.4	29	13.3	9,828	12,844	11,336	.53
East Longmeadow	8	2,264	283	32.8	25	8.8	13,416	16,016	14,716	1.12
Fairhaven	6	768	128	27.5	24	18.8	5,408	7,904	6,656	.42
Falmouth	2(12)*	922	77	21.4	13	16.9				
	6	1,278	213	40.8	39	18.3	11,778	16,848	14,313	.69
Foxboro	8	1,846	231	54.5	42	18.2	9,828	14,196	12,012	.82
Gardner	6	1,466	244	93.6	91	37.3	7,956	17,420	12,688	.66
Greenfield	8	4,883	610	102.7	82	13.4	27,456	35,984	31,720	1.66

(N=no. of sample wks.; Σ=sum of sample values; $\bar{X}$=sample mean; σ=standard deviation; CI=confidence interval; T=tolerance)

*seasonal projection based on ( ) sample days

POPULATION: 10,000-24,999

NON-RESIDENT LOAN PROJECTIONS

Municipality	N	Σ	X̄	σ	CI (±) (.05)	T = CI/X̄ (%)	Projected Annual Volume Low	High	Mean	Mean per Capita
Hingham(1)	4(27)*	4,708	174	91.0	33	19.0				
	3(19)*	872	46	22.5	10	21.7	30,090	44,710	37,400	1.91
Holbrook	8	180	23	9.5	7	30.4	832	1,560	1,196	.10
Holden	2(11)*	256	23	10.3	6	26.1				
	6	374	62	14.9	14	22.6	3,087	5,037	4,062	.30
Holliston	8	223	28	15.5	12	42.9	832	2,080	1,456	.11
Ipswich	8	255	32	16.5	13	40.6	988	2,340	1,664	.14
Longmeadow	8	143	18	5.8	4	22.2	728	1,144	936	.06
Ludlow	8	535	67	15.8	12	17.9	2,860	4,108	3,484	.19
Lynnfield	7	3,864	552	117.0	101	18.3	23,452	33,956	28,704	2.39
Mansfield	7	266	38	11.4	10	26.3	1,456	2,496	1,976	.16
Marshfield	8	132	17	14.6	11	64.7	312	1,456	884	.05
Medfield	8	187	23	7.0	5	21.7	936	1,456	1,196	.12
Middleboro	6	282	47	20.4	20	42.6	1,404	3,484	2,444	.17
Milford	8	810	101	51.1	39	38.6	3,224	7,280	5,252	.23
Millbury	7	378	54	23.5	20	37.0	1,768	3,848	2,808	.23
Newburyport	8	1,047	131	38.9	30	22.9	5,252	8,372	6,812	.42
North Adams	2(12)*	363	30	16.7	10	33.3				
	6	509	85	22.3	22	25.9	4,017	7,293	5,655	.31
North Andover	8	291	36	15.8	12	33.3	1,248	2,496	1,872	.12
North Attleboro	7	488	70	23.8	20	28.6	2,600	4,680	3,640	.19

(N=no. of sample wks.; Σ=sum of sample values; X̄=sample mean; σ=standard deviation; CI=confidence interval; T=tolerance)

*seasonal projection based on ( ) sample days

(1) ceased participation in the free non-resident lending program after the 4th sampling period.

POPULATION: 10,000-24,999

NON-RESIDENT LOAN PROJECTIONS

Municipality	N	Σ	$\bar{X}$	σ	CI (±) (.05)	$T = \frac{CI}{\bar{X}}$ (%)	Projected Annual Volume Low	High	Mean	Mean per Capita
North Reading	8	92	12	6.7	5	41.7	364	884	624	.05
Northborough	8	264	33	13.3	10	30.3	1,196	2,236	1,716	.14
Northbridge	8	415	52	25.8	20	38.2	1,664	3,744	2,704	.22
Oxford	8	43	5	5.1	4	80.0	52	468	260	.02
Palmer	8	856	107	30.6	24	22.4	4,316	6,812	5,564	.47
Reading	8	995	124	11.5	9	7.3	5,980	6,916	6,448	.27
Saugus	8	283	35	31.2	24	68.6	572	3,068	1,820	.07
Scituate	7	214	31	12.6	11	35.5	1,040	2,184	1,612	.09
Seekonk	7	419	60	20.4	18	30.0	2,184	4,056	3,120	.27
Sharon	8	174	22	10.1	8	36.4	728	1,560	1,144	.08
Shrewsbury	7	315	45	21.0	18	40.0	1,404	3,276	2,340	.11
Somerset	7	777	111	38.8	33	29.7	4,056	7,488	5,772	.30
S. Hadley	8	2,036	255	76.0	58	22.7	10,244	16,276	13,260	.80
Southbridge	8	1,972	247	30.3	23	9.3	11,648	14,040	12,844	.76
Stoneham	8	591	74	13.5	10	13.5	3,328	4,368	3,848	.18
Sudbury	1(6)*	35	6	6.4	6	(**)				
	7	61	9	3.7	3	33.3	507	780	643	.04
Tewksbury	7	119	17	7.4	6	35.3	572	1,196	884	.04
Wayland	2(13)*	275	21	14.0	8	38.1				
	4	282	71	14.2	21	29.6	3,048	6,038	4,543	.34

(N=no. of sample wks.; Σ=sum of sample values; $\bar{X}$=sample mean; σ=standard deviation; CI=confidence interval; T=tolerance)

*seasonal projection based on ( ) sample days

**extreme variability of data necessitates mean projection only

POPULATION: 10,000-24,999

NON-RESIDENT LOAN PROJECTIONS

Municipality	N	Σ	$\bar{X}$	σ	CI (±) (.05)	$T = \frac{CI}{\bar{X}}$ (%)	Projected Annual Volume Low	High	Mean	Mean per Capita
Webster	7	671	96	10.9	9	9.4	4,524	5,460	4,992	.35
Westborough	8	167	21	9.8	8	38.1	676	1,508	1,092	.08
Westford	8	144	18	14.9	11	61.1	364	1,508	936	.07
Weston	8	399	50	19.2	15	30.0	1,820	3,380	2,600	.23
Westport	7	60	9	11.0	9	(**)	(**)	(**)	468	.04
Westwood	3(21)*	1,274	61	29.5	12	19.7				
	5	912	182	54.2	62	34.1	10,588	17,893	14,241	1.02
Whitman	6	89	15	2.9	3	20.0	624	936	780	.06
Wilbraham	8	372	47	18.6	14	29.8	1,716	3,172	2,444	.19
Wilmington	7	1,169	167	56.2	48	28.7	6,188	11,180	8,684	.49
Winchester	8	1,289	161	50.5	39	24.2	6,344	10,400	8,372	.37
Winthrop	8	27	3	3.3	3	(**)	(**)	(**)	156	.01
Yarmouth	2(12)*	212	18	8.5	5	27.8				
	6	107	18	14.1	14	77.8	1,170	3,042	2,106	.12

*seasonal projection based on ( ) sample days
**extreme variability of data necessitates mean projection only

(N=no. of sample wks.; Σ=sum of sample values; $\bar{X}$=sample mean; σ=standard deviation; CI=confidence interval; T=tolerance)

POPULATION: 5,000-9,999

NON-RESIDENT LOAN PROJECTIONS

Municipality	N	Σ	$\bar{X}$	σ	CI (±) (.05)	$T = \frac{CI}{\bar{X}}$ (%)	Projected Annual Volume Low	High	Mean	Mean per Capita
Avon	8	646	81	22.5	17	21.0	3,328	5,096	4,212	.79
Ayer	7	322	46	28.1	11	23.9	1,820	2,964	2,392	.36
Cohasset	7	248	35	12.8	11	31.4	1,248	2,392	1,820	.23
Dennis	2(10)*	735	74	54.9	36	48.6				
	6	198	33	6.6	6	18.2	3,523	8,671	6,097	.65
Dudley	8	603	75	22.3	17	22.7	3,016	4,784	3,900	.50
E. Bridgewater	7	33	5	3.5	3	37.5	104	416	260	.03
Georgetown	8	112	14	10.4	8	57.1	312	1,144	728	.12
Granby	7	81	12	6.9	6	50.0	312	936	624	.11
Great Barrington	8	435	54	26.4	20	37.0	1,768	3,848	2,808	.40
Groton	7	55	8	5.0	4	44.4	208	624	416	.08
Hamilton	8	36	5	4.6	3	60.0	104	416	260	.04
Hansen	7	9	1	2.2	2	(**)	(**)	(**)	52	.01
Harwich	2(13)*	288	22	15.3	8	36.4				
	6	436	73	16.0	15	20.5	3,445	5,967	4,706	.60
Hopkinton	8	359	45	25.6	20	44.4	1,300	3,380	2,340	.37
Kingston	8	350	44	24.7	20	45.5	1,248	3,328	2,288	.34
Lakeville	2(6)*	20	3	2.1	2	66.7				
	6	0	0	0	0	0	52	260	156	.03
Lancaster	2(10)*	38	4	4.9	3	75.0				
	5	523	105	24.9	28	26.7	3,068	5,642	4,355	.77

(N=no. of sample wks.; Σ=sum of sample values; $\bar{X}$=sample mean; σ=standard deviation; CI=confidence interval; T=tolerance)

*seasonal projection based on ( ) sample days

**extreme variability of data necessitates mean projection only

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POPULATION: 5,000-9,999

NON-RESIDENT LOAN PROJECTIONS

Municipality	N	Σ	$\bar{X}$	σ	CI (±) (.05)	$T = \frac{CI}{\bar{X}}$ (%)	Projected Annual Volume Low	High	Mean	Mean per Capita
Lee	7	272	39	17.9	16	41.0	1,196	2,860	2,025	.32
Lenox	1(6)*	605	101	14.9	14	13.9				
	6	1,660	277	49.0	44	15.9	13,994	19,090	16,542	2.89
Lincoln	7	214	31	16.8	14	45.2	884	2,340	1,612	.25
Littleton	6	213	36	20.2	18	50.0	936	2,808	1,872	.28
Lunenburg	6	76	13	6.3	6	46.2	364	988	676	.08
Manchester	6	138	23	4.0	4	17.4	988	1,404	1,196	.22
Mattapoisset	6	38	6	3.9	4	66.7	104	520	312	.06
Maynard	8	225	28	10.1	8	28.6	1,040	1,872	1,456	.15
Medway	8	300	38	18.4	14	36.8	1,248	2,704	1,976	.24
Monson	7	227	32	12.4	11	34.4	1,092	2,236	1,664	.23
Nantucket	2(12)*	624	52	22.5	13	25.0				
	6	194	32	23.5	23	71.9	3,393	7,215	6,318	1.14
Norfolk	7	296	42	25.0	21	50.0	1,092	3,276	2,184	.37
Norton	8	101	13	6.4	5	38.5	416	936	676	.07
Pepperell	8	137	17	11.9	9	52.9	416	1,352	884	.13
Raynham	8	27	3	2.8	2	66.7	52	260	156	.02
Rehobeth	8	37	5	4.2	3	60.0	104	416	260	.04
Rockport	7	234	33	2.7	11	33.3	1,144	2,288	1,716	.27
#Montague	6	106	18	12.5	12	66.7	312	1,560	936	.11

(N=no. of sample wks.; Σ=sum of sample values; $\bar{X}$=sample mean; σ=standard deviation; CI=confidence interval; T=tolerance)

*seasonal variation based on ( ) sample days.

POPULATION: 5,000-9,999

NON-RESIDENT LOAN PROJECTIONS

Municipality	N	Σ	$\bar{X}$	σ	CI (±) (.05)	$T = \frac{CI}{\bar{X}}$ (%)	Projected Annual Volume Low	High	Mean	Mean per Capita
Sandwich	7	185	26	10.0	9	31.0	884	1,820	1,352	.21
Spencer	7	98	14	9.7	8	57.1	312	1,144	728	.07
Sturbridge	6	247	41	10.3	10	24.4	1,612	2,652	2,132	.39
Topsfield	8	1,762	220	25.9	20	9.1	10,400	12,480	11,440	1.93
Ware	8	373	47	14.3	11	23.4	1,872	3,016	2,444	.28
W. Boylston	8	100	13	11.7	9	69.2	208	1,144	676	.11
Williamstown	8	286	36	17.6	13	36.1	1,196	2,548	1,872	.23

(N=no. of sample wks.; Σ=sum of sample values; $\bar{X}$=sample mean; σ=standard deviation; CI=confidence interval; T=tolerance)

POPULATION: 2,000-4,999

NON-RESIDENT LOAN PROJECTIONS

Municipality	N	Σ	$\bar{X}$	σ	CI (±) (.05)	$T = \frac{CI}{\bar{X}}$ (%)	Projected Annual Volume Low	High	Mean	Mean per Capita
Ashburnham	7	1	.1	.4	.3	(**)	(**)	(**)	5	.00
Ashby	8	41	5	9.5	7	(**)	(**)	(**)	260	.11
Barre	8	176	22	12.4	9	40.9	676	1,612	1,144	.28
Bolton	8	87	11	13.2	10	90.9	52	1,092	572	.24
Boxborough	1(6)*	50	8	6.2	6	75.0				
	6	2	.3	.8	.8	(**)	93	561	327	.12
Boxford	8	254	32	8.3	6	18.8	1,352	1,976	1,664	.37
Boylston	7	77	11	10.3	9	81.8	104	1,040	572	.17
Brewster	7	248	35	15.5	13	52.0	1,144	2,496	1,820	.49
Brimfield	6	9	2	2.8	3	(**)	(**)	(**)	104	.05
Carlisle	8	34	4	5.5	4	(**)	(**)	(**)	208	.07
Deerfield	7	215	31	18.9	16	51.6	780	2,444	1,612	.38
Dover	8	117	15	6.9	5	33.3	520	1,040	780	.16
Eastham	1(5)*	279	56	28.2	32	57.1				
	5	5	1	1.4	2	(**)	766	2,906	1,866	.61
Edgertown	2(12)*	93	8	3.9	2	25.0				
	6	115	19	9.2	9	47.4	858	1,852	1,355	.64
Essex	7	71	10	4.3	4	40.0	312	728	520	.18
Halifax	1(6)*	123	21	7.4	7	33.3				
	6	229	38	13.9	14	36.8	1,638	3,458	2,548	.54

(N=no. of sample wks.; Σ=sum of sample values; $\bar{X}$=sample mean; σ=standard deviation; CI=confidence interval; T=tolerance)

*seasonal projection based on ( ) sample days

**extreme variability of data necessitates mean projection only

NON-RESIDENT LOAN PROJECTIONS

POPULATION: 2,000-4,999

Municipality	N	Σ	$\bar{X}$	σ	CI (±) (.05)	$T = \frac{CI}{\bar{X}}$ (%)	Projected Annual Volume Low	High	Mean	Mean per Capita
Hatfield	8	83	10	3.8	3	30.0	364	676	520	.17
Hopedale	1(4)*	143	36	20.1	29	80.6				
	6	349	58	16.7	16	27.6	2,093	5,057	3,575	.89
Mendon	6	6	1	2.5	2	(**)	(**)	(**)	52	.02
Merrimac	8	19	2	3.5	3	(**)	(**)	(**)	104	.02
Nahant	8	68	9	7.7	6	66.7	156	780	468	.11
Newbury	8	185	23	5.2	4	17.4	988	1,404	1,196	.28
N. Brookfield	8	130	16	5.2	4	25.0	624	1,040	832	.20
Paxton	8	125	16	6.7	5	31.3	572	1,092	832	.22
Princeton	8	29	4	4.5	3	75.0	52	364	208	.19
Rowley	8	61	8	2.8	2	25.0	312	520	416	.12
Sherborn	8	153	19	6.0	5	26.3	728	1,248	988	.24
Southampton	8	41	5	6.6	5	(**)	(**)	(**)	260	.07
Sterling	8	12	2	1.9	1	50.0	52	156	104	.02
Stow	7	68	10	6.3	5	50.0	260	780	520	.11
Sutton	7	177	25	10.9	9	36.0	832	1,768	1,300	.26
Tisbury	8	1,818	227	62.8	48	21.1	9,308	14,300	11,804	4.29
Upton	8	168	21	9.6	7	33.3	728	1,456	1,092	.29
Warren	8	30	4	8.4	6	(**)	(**)	(**)	208	.06

(N=no. of sample wks.; Σ=sum of sample values; $\bar{X}$=sample mean; σ=standard deviation; CI=confidence interval; T=tolerance)

*seasonal projection based on ( ) sample days

**extreme variability of data necessitates mean projection only

POPULATION: 2,000-4,999

NON-RESIDENT LOAN PROJECTIONS

Municipality	N	Σ	$\bar{X}$	σ	CI (±) (.05)	$T = \frac{CI}{\bar{X}}$ (%)	Projected Annual Volume Low	High	Mean	Mean per Capita
Wenham	6	249	42	17.5	17	40.5	1,300	3,068	2,184	.65
W. Brookfield	7	59	8	5.5	5	62.5	156	676	416	.14
W. Newbury	8	347	43	16.3	12	27.9	1,612	2,860	2,236	.85

(N=no. of sample wks.; Σ=sum of sample values; $\bar{X}$=sample mean; σ=standard deviation; CI=confidence interval; T=tolerance)

POPULATION: 0-1,999

NON-RESIDENT LOAN PROJECTIONS

Municipality	N	Σ	$\bar{X}$	σ	CI (±) (.05)	$T = \frac{CI}{\bar{X}}$ (%)	Projected Annual Volume Low	High	Mean	Mean per Capita
Ashfield	2(6)*	34	6	5.2	5	83.3				
	5	1	.2	.4	.5	(**)	47	437	242	.17
Becket	3(1)*	39	4	1.6	1	25.0				
	5	6	1	2.6	3	(**)	248	390	319	.28
Chester	7	13	2	3.1	3	(**)	(**)	(**)	104	.09
Chesterfield	8	22	3	3.7	3	(**)	(**)	(**)	156	.18
Chilmark	2(6)*	122	20	8.3	8	40.0				
	5	147	29	13.3	15	51.7	1,014	2,808	1,911	4.77
Clarksburg	7	90	13	9.3	8	61.5	260	1,092	676	.35
E. Brookfield	7	146	21	16.5	14	66.7	364	1,820	1,092	.55
Egremont	2(4)*	45	11	5.9	9	81.8				
	6	47	8	3.8	4	50.0	208	988	598	.49
Hinsdale	7	166	24	11.5	10	41.7	728	1,768	1,248	.71
New Marlboro	1(2)*	40	20	7.1	58					
	7	0	0	0	0	(**)	(**)	(**)	260	.24
Petersham	8	15	2	2.3	2	(**)	(**)	(**)	104	.09
Plympton	6	28	5	8.2	8	(**)	(**)	(**)	260	.15
Richmond	7	8	1	2.6	2	(**)	(**)	(**)	52	.03
Rowe	7	3	.4	1.1	1	(**)	(**)	(**)	20	.06
Russell	8	36	5	5.7	4	80.0	52	468	260	.16
Shelburne	6	258	43	7.4	7	16.3	1,872	2,600	2,236	1.14

(N=no. of sample wks.; Σ=sum of sample values; $\bar{X}$=sample mean; σ=standard deviation; CI=confidence interval; T=tolerance)

POPULATION: 0-1,999

NON-RESIDENT LOAN PROJECTIONS

Municipality	N	Σ	$\bar{X}$	σ	CI (±) (.05)	$T = \frac{CI}{\bar{X}}$ (%)	Projected Annual Volume Low	High	Mean	Mean per Capita
Truro	8	45	6	7.9	6	(**)	(**)	(**)	312	.25
Wellfleet	2(12)*	195	16	11.9	7	43.8				
	6	75	26	19.8	19	73.1	975	3,549	2,262	1.15
Wendell	7	7	1	1.7	1	(**)	(**)	(**)	52	.08
W. Stockbridge	6	63	11	2.6	3	27.3	416	728	572	.42
W. Tisbury	3(9)*	156	17	10.5	7	41.2				
	4	36	9	5.3	8	88.9	617	1,956	1,287	1.88
Westhampton	6	6	1	1.5	1	(**)	(**)	(**)	52	.05

*seasonal projection based on ( ) sample days.

**extreme variability necessitates mean projection only

(N=no. of sample wks.; Σ=sum of sample values; $\bar{X}$=sample mean; σ=standard deviation; CI=confidence interval; T=tolerance)

NON-RESIDENT LENDING

Population Group Characteristics of "Heavy Lending" Municipalities

METHODOLOGY

For the purpose of determining characteristics of "heavy lending" municipalities/libraries, data analysis was restricted to municipalities of over 10,000 population. These municipalities account for approximately 91% of all non-resident loans.

Analysis was further limited to those municipalities submitting data for at least 6 of the 8 sampling periods:

Population Group	No. of Municipalities	No. in Data (6+ reports)
over 50,000	22	18
25,000 - 49,999	39	32
10,000 - 24,999	87	65

Data Categories

Non-Resident Loans Per Capita - The mean projection of total non-resident loans made (see previous section) divided by municipal population.

Per Capita Library Income - Per capita total library income as reported for FY 1977.

Library Expenditure as a Percentage of Total Municipal Expenditure - Based on data submitted by municipal fiscal officers to the Bureau of Accounts, Massachusetts Department of Revenue (FY 1977).

True Value Tax Rate (also referred to as the "equalized" or "full value" tax rate) - An approximation of the effective or true rate of taxation in each city or town. Determined by the State Tax Commission in accordance with its biennial estimate of the total "full market value" of the taxable property wealth of each city or town.

Per Capita Expenditure for Library Materials - Data submitted by Massachusetts libraries (FY 1977) for all materials, print and non-print.

Total Circulation Per Capita - Data submitted by Massachusetts libraries (FY 1977) for all circulation: print, non-print, resident, non-resident, and interlibrary loan.

Local Circulation - PLEASE NOTE: A more proper designation for this category would have been

net circulation, and it is generally so referred to in narrative sections. It represents the total circulation less direct non-resident loan totals.

Holdings Per Capita - Data submitted by Massachusetts libraries for FY 1977, print and non-print.

Professionals Per 10,000 Population - The number of graduate (MLS) degree holders as reported by Massachusetts libraries at the beginning of FY 1977 divided by municipal population, then multiplied by 10,000.

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Analyses are presented in the form of correlation matrices for 3 population groups: 50,000 plus, 25,000 - 49,999 and 10,000 - 24,999.

Significant relationships do not, of course, justify a definitive assignment of causal properties. In certain instances, however, substantial causal implications are justified.

NON RESIDENT LOANS AND MUNICIPAL LIBRARY AND FINANCE DATA

POPULATION: 50,000 + Municipality	(A) Non Resident Loans Per Cap.	(B) Per Cap. Library Income ($)	(C) Lib. Exp. As% of Total Munic. Exp.	(D) True Value Tax Rate Per $1,000 ($)	(E) Per Cap. Exp. For Lib. Mat. ($)	(F) Total Circ. Per Cap.	(G) Local Circ. (F-A)	(H) Holdings Per Cap.	(I) Professionals (MLS) Per 10,000 Pop.
1. Arlington	.14	12.90	2.04	50.70	1.81	6.66	6.52	4.07	3.78
2. Boston	.55	15.07	1.81	123.92	2.14	3.75	3.20	6.77	1.65
3. Brockton	.16	6.50	1.00	60.04	1.06	5.20	5.04	2.32	.73
4. Brookline	1.21	20.35	2.58	57.65	3.11	10.02	8.81	6.38	4.14
5. Cambridge	.33	11.28	ND	68.13	1.48	5.66	5.33	3.66	1.57
6. Chicopee	.06	5.54	.99	59.94	.82	4.25	4.19	2.58	.17
7. Framingham	.23	10.71	1.60	37.82	1.72	9.03	8.80	2.73	2.29
8. Lawrence	.11	6.25	1.24	57.27	.78	4.01	3.90	3.42	.30
9. Lowell	.05	3.80	.60	66.46	.81	2.32	2.27	3.90	.11
10. Lynn	.10	8.39	1.11	78.96	1.03	4.57	4.47	3.25	.50
11. Malden	.12	7.91	1.14	64.68	1.49	4.28	4.16	3.61	1.61
12. Newton	.08	10.63	1.25	53.18	1.30	6.89	6.81	3.58	1.79
13. Pittsfield	.39	8.05	.73	46.40	1.24	10.34	9.95	2.99	1.27
14. Quincy	.25	10.83	1.23	61.13	1.29	6.39	6.14	2.60	1.53
15. Springfield	.41	12.37	2.07	66.30	1.46	5.80	5.39	4.06	1.07
16. Waltham	.02	6.25	.92	43.63	.94	3.22	3.20	2.68	.88
17. Weymouth	.18	8.25	1.38	49.13	1.13	6.12	5.94	2.54	.70
18. Worcester	.84	10.68	1.80	61.64	1.53	4.65	3.81	4.52	1.97

POPULATION GROUP: 50,000 +

Coefficients of Correlation Among Non-Resident Loans and Municipal Library and Finance Data

note: relationships are linear (y=a+bx) unless otherwise noted

		A	B	C	D	E	F	G	H	I
A. Non-Resident Loans Per Capita	A		.786	.724	.200	.813	.454	.334	.722	.613
B. Per Capita Total Library Income	B	.786		.901	.263	.946	.540	.456	.746	.833
C. Library Expenditures as % of Total Municipal Expenditure	C	.724	.901		.155	.838	.382	.299	.671	.772
D. True Value Tax Rate Per $1,000	D	.200	.263	.155		.216	-.426	-.480	.629	-.113
E. Per Capita Expenditure for Library Materials	E	.813	.946	.838	.216		.544	.457	.727	.872
F. Total Circulation Per Capita	F	.454	.540	.382	-.426	.544		.991	.053	.612
G. Local Circulation Per Capita (F-A)	G	.334	.456	.299	-.480	.457	.991		-.049	.558
H. Holdings Per Capita	H	.722	.746	.671	.629	.772	.053	-.049		.533
I. Professionals (MLS) Per 10,000 Population	I	.613	.833	.772	-.113	.872	.612	.558	.533	

Underlined Coefficients Significant at .01 .05

POPULATION GROUP ANALYSIS (50,000 +)

Relationships Among Non-Resident Loan Measures and Municipal Library and Finance Data

General Group Characteristics (refer to page 28)

Correlation coefficients among libraries in the 50,000 + population group confirm a number of anticipated significant and non-significant relationships involving indicators of support, resources and activity, such as:

1. Highly significant positive relationships among library support and expenditure indicators (B-C; B-E; C-E).

2. Non-significant relationships between library holdings per capita (H) and measures of circulation (F and G).

However, certain relationships were not anticipated, and require identification and interpretation:

1. Unanticipated non-significant relationships between indicators of library income and expenditures (B,C and E) and net circulation (G).

   --Public libraries in New Bedford and Fall River did not submit sufficient sample data to warrant their inclusion in these computations. Inasmuch as both municipalities had low per capita library support figures and low per capita circulation figures for FY 1877, their inclusion would have raised to positive statistical significance the relationships between per capita library income and net circulation per capita (B-G), and between per capita expenditure for library materials and net circulation per capita (E-G).

   -- However, there are significant positive relationships between library income and materials expenditures (B and E) and total circulation (F).

Non-Resident Loan Relationships (refer to page 28)

1. Based on significant relationships A-B, A-C, A-E, A-H, A-I, it may be said that:

   In the 50,000 + population group, "heavy non-resident lenders" may be characterized as those libraries which tend to:

   a) *have a high per capita library income*

   b) *receive a better than average share of the total municipal budget*

   c) *spend substantially more for library materials than other libraries in this population group*

d) *have significantly large holdings (on a per capita basis)*

e) *have more graduate professionals (per 10,000 population) on staff than libraries not characterized as heavy non-resident lenders.*

The most powerful positive relationship with causal implications is between non-resident loans per capita (A) and per capita expenditure for library materials (E).

2. Perhaps the most striking implication of this analysis pertains to relationships between holdings and circulation.

--Relationships between <u>total</u> circulation and library holdings (.053) and <u>net</u> circulation and holdings (-.049) are not conclusive; however, the relationship between <u>non-resident</u> circulation and holdings (.722) is highly significant. This suggests that, for this population group, considerably more retrospective materials (proportionately) are used by non-resident borrowers than by resident borrowers.

NON RESIDENT LOANS AND MUNICIPAL LIBRARY AND FINANCE DATA

POPULATION: 25,000-49,999 Municipality	(A) Non Resident Loans Per Cap.	(B) Per Cap. Library Income ($)	(C) Lib. Exp. As% of Total Munic. Exp.	(D) True Value Tax Rate Per $1,000 ($)	(E) Per Cap. Exp. For Lib. Mat. ($)	(F) Total Circ. Per Cap.	(G) Local Circ. (F-A)	(H) Holdings Per Cap.	(I) Professionals (MLS) Per 10,000 Pop.
1. Andover	1.14	15.59	ND	31.90	2.67	14.87	13.73	5.55	4.22
2. Attleboro	.41	7.37	1.17	43.07	1.80	5.67	5.26	3.34	.61
3. Barnstable	.48	11.38	1.03	17.13	1.71	10.35	9.87	5.69	.75
4. Belmont	.87	15.90	2.54	36.11	2.46	11.92	11.05	4.55	2.17
5. Beverly	.24	11.06	1.66	45.30	2.62	7.77	7.53	3.15	1.07
6. Chelsea	.36	7.87	.98	84.96	1.84	5.87	5.51	5.63	1.20
7. Danvers	.62	10.63	ND	34.30	2.23	5.97	5.35	3.90	0
8. Dedham	.15	11.76	2.14	36.68	2.30	6.61	6.46	4.61	2.23
9. Everett	.07	8.38	ND	39.20	1.19	4.60	4.53	4.46	.76
10. Fitchburg	1.46	10.00	1.95	54.21	2.01	7.69	6.23	4.45	1.79
11. Gloucester	.35	10.73	1.49	48.14	1.82	6.15	5.80	3.05	.74
12. Haverhill	.07	8.11	.93	49.90	1.32	6.54	6.47	3.68	.68
13. Leominster	.14	6.93	1.44	37.44	1.37	9.15	9.01	2.49	.85
14. Lexington	1.18	16.19	1.97	38.90	3.19	14.94	13.76	5.72	3.08
15. Marlborough	.63	7.90	1.47	45.08	1.34	9.24	8.61	3.05	.99
16. Melrose	.42	9.73	1.71	47.40	1.39	7.32	6.90	3.81	.62
17. Milton	.21	11.56	2.12	40.48	2.08	9.13	8.92	5.16	2.57
18. Natick	.03	10.50	1.38	41.85	1.44	8.20	8.17	6.10	2.57
19. Needham	.51	12.47	1.51	34.58	2.15	12.12	11.61	4.46	1.34

NON RESIDENT LOANS AND MUNICIPAL LIBRARY AND FINANCE DATA

POPULATION: 25,000-49,999 Municipality	(A) Non Resident Loans Per Cap.	(B) Per Cap. Library Income ($)	(C) Lib. Exp. As% of Total Munic. Exp.	(D) True Value Tax Rate Per $1,000 ($)	(E) Per Cap. Exp. For Lib. Mat. ($)	(F) Total Circ. Per Cap.	(G) Local Circ. (F-A)	(H) Holdings Per Cap.	(I) Professionals (MLS) Per 10,000 Pop.
20. Northampton	1.15	10.21	1.32	42.16	1.92	9.85	8.70	11.68	1.81
21. Norwood	.24	10.05	1.57	35.69	1.60	5.90	5.66	2.69	1.60*
22. Plymouth	.56	10.54	1.53	36.00	1.66	8.58	8.02	2.74	1.86
23. Randolph	.11	5.18	.84	46.54*	.77	5.35	5.24	2.06	1.03
24. Salem	.67	11.63	1.45	48.25	2.73	6.26	5.59	4.56	1.04
25. Stoughton	.44	8.88	1.44	36.31	2.19	7.78	7.34	3.53	1.94
26. Taunton	1.15	5.13	.91	42.46	.98	10.81	9.66	4.68	.24
27. Wakefield	.36	13.21	ND	49.88	2.14	6.03	5.67	3.69	2.30
28. Watertown	.24	14.84	2.34	57.98	2.01	6.64	6.40	4.01	2.22
29. Wellesley	2.32	17.65	2.52	37.41	3.99	14.23	11.91	3.49	5.26
30. W. Springfield	.25	6.87	1.29	35.70	1.16	5.67	5.42	3.25	1.06
31. Westfield	.47	10.12	1.58	39.69	1.39	10.74	10.27	4.05	.61
32. Woburn	.05	6.77	.92	44.60	1.00	3.80	3.75	2.64	.57

* 1978 data

POPULATION GROUP: 25,000-49,999

Coefficients of Correlation Among Non-Resident Loans and Municipal Library and Finance Data

note: relationships are linear (y=a+bx) unless otherwise noted

		A	B	C	D	E	F	G	H	I
A. Non-Resident Loans Per Capita	A		.497	.412	-.108	.643	.682	.575	.299	.561
B. Per Capita Total Library Income	B	.497		.831	-.198	.846	.609	.589	.236	.755
C. Library Expenditures as % of Total Municipal Expenditure	C	.412	.831		-.117	.695	.452	.422	.029	.716
D. True Value Tax Rate Per $1,000	D	-.108	-.198	-.117		-.096	-.386	-.412	.005	-.114
E. Per Capita Expenditure for Library Materials	E	.643	.846	.695	-.096		.552	.498	.197	.713
F. Total Circulation Per Capita	F	.682	.609	.452	-.386	.552		.990	.336	.600
G. Local Circulation Per Capita (F-A)	G	.575	.589	.422	-.412	.498	.990		.320	.565
H. Holdings Per Capita	H	.299	.236	.029	.005	.197	.336	.320		.220
I. Professionals (MLS) Per 10,000 Population	I	.561	.755	.716	-.114	.713	.600	.565	.220	

Underlined Coefficients Significant at .01/ .05

POPULATION GROUP ANALYSIS (25,000 - 49,999)

Relationships Among Non-Resident Loan Measures and Municipal Library and Finance Data

General Group Characteristics (refer to page 33)

Correlation coefficients among libraries in the 25,000 - 49,999 population group confirm a number of anticipated significant and non-significant relationships involving indicators of support, resources and activity, such as:

1. Highly significant positive relationships among library income and expenditure indicators (B-C; B-E; C-E).

2. Non-significant relationships between library holdings per capita (H) and measures of circulation (F and G)

3. Significant positive relationships between indicators of library income and expenditures (B, C and E) and measures of circulation (F and G).

The significant inverse relationship between net circulation and the true value tax rate (D-G) requires further explanation. On the surface, this might appear to be a meaningless and accidental correlation, inasmuch as causal properties cannot logically be attributed to either factor; i.e., high library circulation could not cause a low municipal tax rate, nor could we assume that an increase in the municipal tax rate would cause a concomitant decrease in library circulation.

The validity of the correlation depends on the introduction of two socio-economic variables not included in the original matrix: Personal Income Per Capita and Median School Years completed.

	A	B	C	D
A. Personal Income Per Capita . . .		.839	.612	-.349
B. Median School Years Completed .	.839		.489	-.430
C. Net Circulation Per Capita . . .	.612	.489		-.412
D. True Valure Tax Rate	-.349	-.430	-.412	

All of the relationships indicated above are statistically significant at the .05 level.

We see that:

1. Such socioeconomic factors as personal income and educational level relate positively with library use.

2. Such socioeconomic factors as personal income and educational level relate negatively with local tax rates.

Therefore, we assume that the negative relationship between library use and local tax rates is conditioned, to a degree, by these measures of community socioeconomic status.

(Relationships between local tax effort and the use of public libraries in other communities are explored in the section on "Non-Resident Borrowing")

Non-Resident Loans Relationships (see page 33)

Based on significant relationships A-B, A-C, A-E, A-F, A-G, A-I, it may be said that:

In the 25,000 - 49,999 population group, "heavy non-resident lenders" may be characterized as those libraries which tend to:

a) *have a high per capita library income*

b) *receive a better than average share of the municipal budget*

c) *spend substantially more for library materials than other libraries in this population group*

d) *have higher total and net circulation rates*

e) *have more graduate professionals (per 10,000 population) on staff than libraries not characterized as heavy non-resident lenders.*

The most powerful positive relationship with causal implications is between non-resident loans per capita (A) and per capita expenditures for library materials (E).

There are no significant relationships between indicators of library use (A,F,G) and total library holdings (H). However, all relationships between indicators of library use and expenditure for library materials are significant (A-E, F-E, G-E). This suggests that, for this population group, considerably more current than retrospective materials are used by both resident and non-resident borrowers.

NON RESIDENT LOANS AND MUNICIPAL LIBRARY AND FINANCE DATA

POPULATION: 10,000-24,999 Municipality	(A) Non Resident Loans Per Cap.	(B) Per Cap. Library Income ($)	(C) Lib. Exp. As% of Total Munic. Exp.	(D) True Value Tax Rate Per $1,000 ($)	(E) Per Cap. Exp. For Lib. Mat. ($)	(F) Total Circ. Per Cap.	(G) Local Circ. (F-A)	(H) Holdings Per Cap.	(I) Professionals (MLS) Per 10,000 Pop.
1. Acton	.46	9.72	1.60	30.60	1.74	10.52	10.06	2.78	3.30
2. Adams	.66	6.12	1.76	35.40	1.02	7.81	7.15	3.44	0
3. Amesbury	.10	9.10	1.39	54.38	2.13	6.25	6.15	6.03	1.45
4. Amherst	.80	13.02	2.79	35.16	1.77	9.37	8.57	4.36	1.79
5. Athol	.41	6.33	1.36	36.74	1.17	7.61	7.20	3.52	.92
6. Auburn	.57	8.95	1.60	39.40	1.41	7.65	7.08	3.23	.64
7. Bedford	.24	13.81	1.53	34.80	2.49	8.04	7.80	5.79	5.69
8. Bridgewater	.16	10.76	1.89	43.00	2.15	7.64	7.48	4.61	2.94
9. Burlington	.18	5.17	ND	45.86	1.54	4.40	4.22	2.13	1.23
10. Concord	.95	21.85	ND	33.50	3.80	15.58	14.63	11.16	3.47
11. Dartmouth	.53	7.89	1.64	28.22	1.18	7.26	6.73	3.78	.93
12. E. Longmeadow	1.12	9.26	1.62	37.60	1.67	11.47	10.37	3.24	.76
13. Fairhaven	.42	7.94	1.50	41.00	1.29	4.65	4.23	4.73	.63
14. Falmouth	.69	12.87	2.52	23.52	1.65	14.90	14.71	5.68	1.45
15. Foxboro	.82	9.08	1.41	36.36	1.88	8.03	7.21	3.47	.68
16. Gardner	.66	11.10	1.43	50.76	1.43	5.32	4.66	3.74	.52
17. Greenfield	1.66	7.90	1.29	47.73	1.81	10.63	8.97	6.42	.52
18. Hingham(1)	1.91	17.52	ND	38.43	2.25	19.18	17.27	7.31	2.05

NON RESIDENT LOANS AND MUNICIPAL LIBRARY AND FINANCE DATA

POPULATION: 10,000-24,999 Municipality	(A) Non Resident Loans Per Cap.	(B) Per Cap. Library Income ($)	(C) Lib. Exp. As% of Total Munic. Exp.	(D) True Value Tax Rate Per $1,000 ($)	(E) Per Cap. Exp. For Lib. Mat. ($)	(F) Total Circ. Per Cap.	(G) Local Circ. (F-A)	(H) Holdings Per Cap.	(I) Professionals (MLS) Per 10,000 Pop.
19. Holbrook	.10	7.39	.94	46.75	1.34	4.78	4.68	2.75	1.69
20. Ho[illegible]	.30	8.37	1.75	28.13	1.39	10.06	9.76	2.58	0
21. Ho[illegible]	.11	5.83	.97	36.00	1.58	7.24	7.13	2.76	1.55
22. Ipswich	.14	9.39	1.31	39.76	2.16	12.89	12.75	5.14	2.60
23. Longmeadow	.06	9.29	1.22	42.12	1.48	12.48	12.42	2.71	[illegible]
24. Ludlow	.19	4.10	.84	38.69	.75	3.40	3.21	1.32	
25. Lynnfield	2.39	10.72	1.42	27.40	3.70	12.71	10.32	4.23	[illegible]
26. Mansfield	.16	5.48	.91	34.04	1.15	4.77	4.61	2.26	1.61
27. Marshfield	.05	6.36	.99*	44.28	1.34	5.52	5.47	1.92	1.03
28. Medfield	.12	4.65	.60	40.23	.98	6.74	6.62	2.23	1.00
29. Middleboro	.17	6.67	.76	42.24	1.39	5.00	4.83	6.99	0
30. Milford	.23	2.79	.50	43.56	.51	5.47	5.24	2.52	0
31. Millbury	.23	3.24	.73	50.58	.87	3.81	3.58	1.50	.83
32. Newburyport	.42	9.69	1.53	44.80	1.62	5.91	5.49	5.25	1.22
33. North Adams	.31	5.80	1.14	55.85	1.06	5.80	5.49	3.62	.54
34. North Andover	.12	8.64	1.46	25.05	1.68	6.99	6.87	3.11	1.26
35. North Attleboro	.19	4.91	.81	32.75	.91	4.30	4.11	2.00	.52
36. North Reading	.05	6.20	.96	39.48	1.24	5.10	5.05	2.72	.83
37. Northboro	.14	11.36	1.79	36.90	2.46	8.87	8.73	2.97	2.84

NON RESIDENT LOANS AND MUNICIPAL LIBRARY AND FINANCE DATA

POPULATION: 10,000-24,999 Municipality	(A) Non Resident Loans Per Cap.	(B) Per Cap. Library Income ($)	(C) Lib. Exp. As% of Total Munic. Exp.	(D) True Value Tax Rate Per $1,000 ($)	(E) Per Cap. Exp. For Lib. Mat. ($)	(F) Total Circ. Per Cap.	(G) Local Circ. (F-A)	(H) Holdings Per Cap.	(I) Professionals (MLS) Per 10,000 Pop.
38. Northbridge	.22	5.48	.98	39.82	1.19	5.93	5.71	3.43	.82
39. Oxford	.02	4.92	1.00	36.00	.84	3.56	3.54	3.20	.92
40. Palmer	.47	6.56	.89*	34.79	1.28	8.92	8.45	2.54	.85
41. Reading	.27	10.58	1.76	43.51	2.18	10.71	10.44	3.36	1.69
42. Saugus	.07	4.86	.84	39.30	.80	4.03	3.96	2.81	.81
43. Scituate	.09	9.08	1.16	43.05	1.52	9.40	9.31	3.45	1.12
44. Seekonk	.27	3.62	.54	30.60	.59	4.61	4.34	1.93	.88
45. Sharon	.08	9.18	1.18	43.29	1.90	9.66	9.58	4.10	0
46. Shrewsbury	.11	9.43	1.84	31.42	2.09	7.50	7.39	4.01	0
47. Somerset	.30	6.62	1.24	24.00	1.27	7.09	6.79	2.65	1.56
48. South Hadley	.80	8.11	1.76	34.78	1.60	7.99	7.19	2.98	1.81
49. Southbridge	.76	7.37	1.65	38.32	1.53	5.49	4.73	2.84	1.18
50. Stoneham	.18	10.07	2.09	42.20	1.97	7.78	7.60	3.13	.93
51. Sudbury	.04	9.53	1.23	36.48	1.68	12.20	12.16	2.79	3.34
52. Tewksbury	.04	3.52	.61	39.00	.60	2.76	2.72	1.35	.42
53. Wayland	.34	11.75	1.52	46.31	2.55	13.30	12.96	4.34	3.76
54. Webster	.35	5.42	1.25	41.40	.82	6.40	6.05	2.11	0
55. Westboro	.08	7.90	.89	31.82	1.42	7.50	7.42	3.14	.72

NON RESIDENT LOANS AND MUNICIPAL LIBRARY AND FINANCE DATA

POPULATION: 10,000-24,999 Municipality	(A) Non Resident Loans Per Cap.	(B) Per Cap. Library Income ($)	(C) Lib. Exp. As% of Total Munic. Exp.	(D) True Value Tax Rate Per $1,000 ($)	(E) Per Cap. Exp. For Lib. Mat. ($)	(F) Total Circ. Per Cap.	(G) Local Circ. (F-A)	(H) Holdings Per Cap.	(I) Professionals (MLS) Per 10,000 Pop.
56. Westford	.07	7.89	1.21	40.60	1.69	6.86	6.79	4.12	0
57. Weston	.23	11.20	1.33	33.60	1.61	13.44	13.21	5.07	2.61
58. Westport	.04	4.96	ND	31.92	1.14	5.95	5.91	1.62	.79
59. Westwood	1.02	14.94	ND	38.86	2.66	12.19	11.17	5.49	2.85
60. Whitman	.06	2.49	.42	50.04	.65	2.67	2.61	2.59	0
61. Wilbraham	.19	10.32	1.80	29.00	2.28	9.45	9.26	3.66	1.52
62. Wilmington	.49	10.55	1.50	43.20	3.14	6.23	5.74	3.66	2.27
63. Winchester	.37	15.94	2.27	44.04	2.39	12.12	11.75	4.62	1.76
64. Winthrop	.01	5.70	1.16	46.73	.86	4.08	4.07	3.53	1.47
65. Yarmouth	.12	3.55	.74	20.60	.56	7.18	7.06	3.20	0

(1) cancelled participation in reciprocal borrowing program effective 7/1/77

* FY1978 data

POPULATION GROUP: 10,000-24,999

Coefficients of Correlation Among Non-Resident Loans and Municipal Library and Finance Data

note: relationships are linear (y=a+bx) unless otherwise noted

		A.	B	C	D	E	F	G	H	I
A. Non-Resident Loans Per Capita	A		.457	.336	-.128	.401	.532	.428	.435	.222
B. Per Capita Total Library Income	B	.457		.817	-.153	.836*	.786	.775	.767	.615
C. Library Expenditures as % of Total Municipal Expenditure	C	.336	.817		-.055	.634	.538	.544	-.268	.319
D. True Value Tax Rate Per $1,000	D	-.128	-.153	-.055		-.048	-.249	-.260	.094	-.117
E. Per Capita Expenditure for Library Materials	E	.401	.836*	.634	-.048		.650	.627	.634	.555
F. Total Circulation Per Capita	F	.532	.786	.538	-.249	.650		.993	.582	.483
G. Local Circulation Per Capita (F-A)	G	.428	.775	.544	-.260	.627	.993		.560	.484
H. Holdings Per Capita	H	.435	.757	-.268	.094	.634	.582	.560		.384
I. Professionals (MLS) Per 10,000 Population	I	.222	.615	.319	-.117	.555	.483	.484	.384	

Underlined Coefficients Significant at .01 .05

*curvilinear exponential relationship ($y=ae^{bx}$).
Linear relationship = .435

POPULATION GROUP ANALYSIS (10,000 - 24,999)

Relationships Among Non-Resident Loan Measures and Municipal Library and Finance Data

General Group Characteristics (refer to page 40)

Correlation coefficients among libraries in the 10,000 - 24,999 population group confirm a number of anticipated significant and non-significant relationships involving indicators of support, resources and activities, such as:

1. Highly significant positive relationships among library income and expenditure indicators (B-C, B-E, C-E).

2. Significant positive relationships between indicators of library income and expenditure (B, C and E) and circulation measures (F and G).

3. A significant negative relationship between the local true value tax rate and net circulation (D-G). --for an interpretation of this relationship see the analysis for the 25,000 - 49,999 population group, preceding.

However, certian relationships were not anticipated, and require identification and interpretation:

1. Unanticipated significant positive relationships between library holdings (H) and measure of circulation (F and G).

   --These relationships are inconsistent with the results of a number of previous studies which have indicated either a non-relationship or a negative relationship between holdings and circulation, particularly for public libraries of this size.

   --One is tempted to hypothesize that the positive correlation herein computed is somehow related to the unusually high correlation between holdings and library income (B-H) and between holdings and materials expenditures (E-H). A more satisfactory implication of causality, however, would require a complicated multiple regression analysis, a technique well beyond our present programming capability.

Non-Resident Loan Relationships (refer to page 40)

1. Based on significant relationships A-B, A-C, A-E, A-F, A-G, and A-H, it may be said that:

In the 10,000 - 24,999 population group, "heavy non-resident lenders" may be characterized as those libraries which tend to:

a) have a high per capita library income

b) receive a better than average share of the municipal budget

c) spend substantially more for library materials than other libraries in this population group

d) have higher total and net circulation rates

e) have significantly large holdings (on a per capita basis).

The most powerful positive relationship with causal implications is between non-resident loans per capita (A) and per capita total library income (B).

2. The positive relationships between non-resident loans and expenditure for library materials (A-E), and between non-resident loans and library holdings (A-H), as well as the modest (though significant) nature of these relationships, suggests that, for this population group, retrospective and current materials are almost equally attractive to non-resident borrowers.

SUMMARY : CHARACTERISTICS OF "HEAVY LENDING" LIBRARIES AND MUNICIPALITIES

The preceding data have been applied to test the following formal hypotheses:

That libraries characterized as "heavy non-resident lenders' will tend to:

1) *have a higher per capita total library income,*
2) *receive a better than average share of the total municipal budget,*
3) *be located in municipalities with a higher than average equalized tax rate,*
4) *spend substantially more for library materials,*
5) *have higher per capita circulation rates,*
6) *have significantly larger holdings (per capita), and*
7) *have more graduate professionals on staff (per 10,000 population)*

than libraries not characterized as "heavy non-resident lenders".

Statistically Significant Relationships Supporting Hypotheses 1 Through 7 (Above):

By Population Group

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Over 50,000	+	+		+		+	+
25,000 - 49,999	+	+		+	+		+
10,000 - 24,999	+	+		+	+	+	
Totals	3+	3+	0	3+	2+	2+	2+

Three of these hypotheses are supported by data in all 3 population groups. *Libraries characterized as "heavy non-resident lenders" tend to:*

1) *have a high per capita income,*
2) *receive a substantial share of the total municipal budget, and*
4) *spend substantially for library materials.*

Three of these hypotheses are supported by data in 2 of the 3 population groups. *Libraries characterized as "heavy non-resident lenders" tend to:*

SUMMARY : CHARACTERISTICS OF "HEAVY LENDING" LIBRARIES AND MUNICIPALITIES

The preceding data have been applied to test the following formal hypotheses:

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	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Over 50,000	+	+		+		+	+
25,000 - 49,999	+	+		+	+		+
10,000 - 24,999	+	+		+	+	+	
Totals	3+	3+	0	3+	2+	2+	2+

Three of these hypotheses are supported by data in all 3 population groups. *Libraries characterized as "heavy non-resident lenders" tend to:*

1) *have a high per capita income,*
2) *receive a substantial share of the total municipal budget, and*
4) *spend substantially for library materials.*

Three of these hypotheses are supported by data in 2 of the 3 population groups. *Libraries characterized as "heavy non-resident lenders" tend to:*

5) have high per capita circulation rates,
6) have significantly large holdings per capita,
7) have achieved a substantial degree of professionalization.

One of these hypotheses is not supported by data in any of the 3 population groupings. Municipalities with libraries characterized as "heavy non-resident lenders" do not tend to:

3) be significantly different from other municipalities with respect to local tax effort.

By and large, our preconceptions are confirmed. Libraries lending substantially to non-residents tend to be active, quality institutions, well supported through per capita municipal appropriations.

NON-RESIDENT BORROWING

Core Activity Area Characteristics of "Heavy Borrowing" Municipalities

METHODOLOGY

In view of the essentially local nature of the non-resident borrowing phenomenon, it was postulated that an analysis of the characteristics of "heavy borrowing" municipalities would be conducted more productively on an areal basis than on a population group basis.

Sixteen Core Areas of significant non-resident lending/borrowing activity have been identified and include most, though not all, of the major lenders and borrowers.

Lending and borrowing totals within these areas have been presented in matrix form in order to give some indication of the extent to which reciprocity does or does not exist. Matrix data are sample data: a projection of total volumes may be obtained by multiplying matrix data by 6.5 .

Core areas, as chosen, do not necessarily represent all of the regions with significant interactions; but, we believe that they do represent the most active of such areas.

It must be pointed out that a number of these areas are overlapping and certain municipalities are included in more than one core area.

Data Catagories

Non-Resident Borrowing Activity Index - The total of projected non-resident loans in the area divided by area population.

Non-Resident Borrowings Per Capita - For each municipality, the number of non-resident borrowings projected from sample data divided by the population of the borrowing municipality.

Median School Year Completed - Latest relevant data gathered from various sources (primarily the 1977 Municipal Year Book. No data available for towns of under 2,000 population (1970 federal census).

Personal Income Per Capita - Municipal figures from Current Population Reports Series P-25 #669 dated May 1977, by U.S. Bureau of the Census.

Per Capita Library Income - Per capita total library income as reported for FY 1977.

Library Materials Expenditure Per Capita - Data submitted by Massachusetts libraries (FY 1977) for all materials, print and non-print.

Total Circulation Per Capita - Data submitted by Massachusetts libraries (FY 1977) for all circulation: print, non-print, resident, non-resident, and interlibrary loan.

True Value Tax Rate - An approximation of the effective or true rate of taxation in each city or town. Determined by the State Tax Commission in accordance with its biennial estimate of the total "full market value" of the taxable property wealth of each city or town.

Professionals Per 10,000 Population- The number of graduate (MLS) degree holders as reported by Massachusetts libraries at the beginning of FY 1977 divided by municipal population, then multiplied by 10,000.

Coefficient of Variation - A measure of areal homogeneity/heterogeneity determined by dividing the standard deviation by the mean. The higher the value of the coefficient, the more heterogeneous the core area with respect to the characteristic under study.

. . . . . .

Correlative relationships have been set forth in matrix form for each core area, with an indication of statistically significant relationships.

(See Technical Appendix for additional information on methodology)

DESCRIPTIVE ANALYSIS : ANDOVER CORE AREA

Number of Municipalities in the Core Area: 15

Non-Resident Borrowing Activity Index: Low (.146), ranking 13th of the 16 core areas.

Educational Level: The area is extremely heterogeneous with respect to this indicator. Median School Years Completed ranges from 10.4 for Lawrence to 13.8 for Andover and 14.3 for Boxford.

Personal Income Level: Ten of the 15 municipalities have a per capita personal income figure below the statewide per capita figure of $4,755. Nevertheless, the area must be judged heterogeneous in this respect, with figures ranging from$3,959 for Lowell to $6,134 for Andover and $7,525 for Boxford.

Total Library Income: Heterogeneous, with per capita library income figures ranging from $2.76 for Methuen to $3.14 for $15.59 for Andover.

Library Materials Expenditure: Very heterogeneous, with per capita figures for expenditures for library materials ranging from $.42 for Methuen to $3.14 for Wilmington.

True Value Tax Rate: Generally speaking, an area of relatively low tax rates, with 12 of the 15 municipalities in this area having equalized tax rates below the statewide average of $47.02 per thousand.

Professional Library Staffing: Residents of this core area would seem to have reasonably satisfactory access to professionalism, with only the 3 smallest communities not having graduate professionals on their staffs during the survey period (Boxford, Middleton and Georgetown). However, 3 other municipalities (Methuen, Lawrence and Lowell) had very low professional commitments during the period of this survey.

The Lenders and the Borrowers (refer to page 49)

The area's largest lender, Andover, accounted for 48% of the non-resident loans made within the area, with Topsfield accounting for an additional 15%. Topsfield loaned almost exclusively to Boxford residents (93%).

Andover's non-resident loans within this core area accounted for 95% of its total non-resident loans. Three municipalities (Lawrence, Methuen, North Andover) received 74% of Andover's non-resident loans.

Five municipalities (Boxford, Lawrence, Methuen, North Andover and Tewksbury), contained 37% of the area's population, accounted for 81% of the area's non-resident borrowing.

General Area Relationships (refer to page 51)

Correlation analysis among socioeconomic, library support, and library activity indicators confirms a number of significant relationships, such as:

1) Significant positive relationships between the socioeconomic status indjcators (educational level and personal income) and library circulation (A-E, B-E).

2) A significant positive relationship between library income and degree of professionalization (C-G).

3) A highly significant positive relationship between library income and materials expenditures (C and D).

4) Significant negative relationships between local tax rates (F) and socioeconomic status indicators (A and B).

Non-Resident Borrowing Relationships (refer to page 51)

Correlation analysis between (a) non-resident borrowings per capita, and (b) various indicators of socio-economic status, library support and library activity produces only one significant relationship. On the basis of that relationship, it may be said that:

In the Andover Core Area, municipalities characterized as "heavy non-resident borrowers" tend to have significantly lower equalized tax rates than municipalities not so characterized.

Reciprocal Borrowing in the Andover Core Area
Total Non-Resident Loans, Periods 1-8

LOANS MADE

LOANS RECEIVED	Andover	Boxford	Dracut	Georgetown	Haverhill	Lawrence	Lowell	Methuen	Middleton	N.Andover	N.Reading	Reading	Tewksbury	Topsfield	Wilmington	Total Loans Received
Andover		3		2	9	37		56		87	28	26			8	256
Boxford	224			25	26					29				1,274		1,578
Dracut	4						108									112
Georgetown	33	10			36									5		84
Haverhill	90	1		31		9				10	1					142
Lawrence	1,002				5			11		53	1	3				1,075
Lowell	21		141										57	6	12	237
Methuen	904				18	877			4	78					3	1,884
Middleton	14									6				89		109
N.Andover	1,266	154			10	36			1						5	1,472
N.Reading	220				2							226	1		24	473
Reading	106										19				11	136
Tewksbury	362						110			26		3			687	1,188
Topsfield	41	12		2							3	3				61
Wilmington	21						3				3	84	15			126
Total Loans Made	4,308	180	141	60	106	959	221	67	5	289	55	345	73	1,374	750	8,933

CORE AREA ANALYSIS: MUNICIPALITIES RANKED BY NON-RESIDENT BORROWINGS PER CAPITA, HIGHEST TO LOWEST

Core Area: Andover

Activity Index = $\frac{\text{Total Projected Non-Resident Volume in Area}}{\text{Area Population}}$ = .146

Population Density = 888.2 per square mile

Municipality (pop.)	NR Borrowings per capita	(A) Median School Yr. Completed	(B) Personal Income Per. Cap. ($)	(C) Library Income Per Cap. ($)	(D) Materials Exp. Per Cap. ($)	(E) Circ. Per Cap.	(F) True Value Tax Rate per $1,000	(G) Professionals (MLS) per 10,000 pop.
1. Boxford (4,565)	2.247	14.3	7,525	11.55	2.80	10.37	26.82	0
2. No. Andover (15,864)	.603	12.5	5,268	8.64	1.68	6.99	25.05	1.26
3. Methuen (35,516)	.345	12.0	4,442	2.76	.42	1.91	38.52	.28
4. Tewksbury (24,049)	.321	12.2	4,094	3.52	.60	2.76	39.00	.41
5. No. Reading (12,125)	.254	12.5	4,704	6.20	1.24	5.10	39.48	.83
6. Middleton (4,032)	.176	12.1	4,301	9.29	2.10	6.76	32.70	0
7. Lawrence (67,515)	.103	10.4	4,035	6.25	.78	4.01	57.27	.30
8. Georgetown (5,912)	.092	12.6	4,546	6.26	1.83	8.39	41.16	0
9. Topsfield (5,913)	.067	13.8	5,999	10.17	2.32	11.41	31.00	3.38
10. Andover (26,050)	.064	12.8	6,134	15.59	2.67	14.87	31.90	4.22
11. Wilmington (17,656)	.046	12.3	4,238	10.55	3.14	6.23	43.20	2.27
12. Reading (23,696)	.037	12.7	5,518	10.43	2.18	10.17	43.51	1.69
13. Dracut (20,287)	.036	11.7	4,308	3.32	.73	2.30	45.98	.49
14. Haverhill (44,399)	.021	11.7	4,426	8.11	1.32	6.54	49.90	.68
15 Lowell (91,177)	.017	11.3	3,959	3.80	.81	2.32	66.46	.11
Mean	.310	12.3	4,900	7.76	1.64	6.68	40.80	1.06
Standard Deviation	.560	.937	1,006	3.64	.876	3.82	11.17	1.30
Coefficient of Variation	1.806	.076	.205	.469	.534	.572	.274	1.23

CORE AREA: Andover

Coefficients of Correlation (Product-Moment) Among Socioeconomic, Library Support, and Library Activity Indicators

A= Median School Year Completed
B= Personal Income Per Capita
C= Total Library Income Per Capita
D= Library Materials Expenditure Per Capita
E= Total Circulation Per Capita
F= True Value Tax Rate per $1,000
G= Graduate Professionals (MLS) per 10,000 pop.

note: relationships are linear (y=a+bx) unless otherwise noted

	A	B	C	D	E	F	G
A		.860*	.556	.664	.682	-.767	.372
B	.860*		.694	.629	.774	-.651	.401
C	.556	.694		.893	.921	-.500	.693
D	.664	.629	.893		.810	-.505	.557
E	.682	.774	.921	.810		-.547	.692
F	-.767	-.651	-.500	-.505	-.547		-.327
G	.372	.401	.693	.557	.692	-.327	

Underlined coefficients significant at .05 level

*Curvilinear exponential relationship (y=aebx)

Coefficients of Correlation (Point-Biserial unless otherwise noted) Between Non-Resident Borrowings Per Capita, and Socioeconomic, Library Support and Library Activity Indicators

	Non-Resident Borrowings Per Capita
Median School Year Completed	.271
Personal Income Per Capita	.131
Total Library Income Per Capita	-.180
Materials Expenditure Per Capita	-.142
Circulation Per Capita	-.181
True Value Tax Rate Per $1,000	-.545
Professionals (MLS) per 10,000 pop.	-.390

Underlined coefficients significant at .05 level

DESCRIPTIVE ANALYSIS: BOSTON CORE AREA

Number of Municipalities in the Core Area: 30 (largest of the 16 core areas)

Non-Resident Borrowing Activity Index: Average (.254), ranking 8th of the 16 core areas.

Educational Level: Heterogeneous, with the "Median School Years Completed" indicator ranging from 11.6 for Somerville to 15.2 for Wellesley.

Personal Income Level: Relatively high, with 19 of the 30 municipalities in the area having per capita personal income figures in excess of the statewide average of $4,755. Nevertheless, the area must be judged heterogeneous in this respect, with figures ranging from $3,957 for Chelsea and $4,157 for Boston to $7,690 for Brookline and $7,858 for Wellesley.

Total Library Income: Relatively homogeneous in comparison with other core areas, yet with a considerable range of values: from $3.16 per capita for Revere to $20.35 for Brookline.

Library Materials Expenditure: Heterogeneous with respect to this indicator, manging from $.40 per capita for Revere and $.77 per capita for Randolph to $3.19 for Lexington and $3.99 for Wellesley.

Professional Library Staffing: Residents of this core area would seem to have very satisfactory access to professionalism, with all libraries reporting professionals on their staffs, and only 3 municipalities (Revere, Everett and Lynn) indicating relatively low professional staff commitments during the period of the survey.

The Lenders and the Borrowers (refer to page 54)

Boston, the area's largest lender, makes approximately half (51%) of the non-resident loans within this area, with Brookline accounting for an additional 13%.

An estimated 72% of Boston's total non-resident loans are made to residents of municipalities in this core area.

Boston is also the heaviest non-resident borrowing community, with a projected volume of 68,159 loans made to its residents by libraries in other municipalities in the core area. In relative terms this is rather low: i.e., Boston has 35% of the area population, but accounts for only 14% of non-resident borrowings.

The Boston-Brookline relationship is quite possibly the most nearly reciprocal relationship in the state between volume lenders: i.e.,

	Non-Resident Loans (projected from sample data)
Boston to Brookline Residents	33,891
Brookline to Boston Residents	46,859

Brookline shows the highest per capita area borrowing rate (.676), but this is not an exceptionally high figure.

General Area Relationships (refer to page 58)

Correlation analysis among socioeconomic, library support, and library activity indicators confirms a number of significant relationships, such as:

1. Highly significant positive relationships between socioeconomic status indicators (educational level and personal income) and library circulation (A-E, B-E).
2. A significant positive relationship between library income and degree of professionalization (C-G).
3. Highly significant positive relationships between library income and materials expenditure indicators (C and D) and library circulation (E).
4. Significant negative relationships between local tax rates (F) and socioeconomic status indicators (A and B); and a concomitant negative relationship between tax rates and library circulation (E-F).

Non-Resident Borrowing Relationships (refer to page 58)

Correlation analysis between (a) non-resident borrowers per capita, and (b) various socioeconomic library support and library activity indicators produces only one significant relationship. On the basis of this relationship, it may be said that:

In the Boston core area, residents of municipalities characterized as "heavy non-resident borrowers" tend to have significantly higher personal incomes than in municipalities not so characterized.

Reciprocal Borrowing in the Boston Core Area
Total Non-Resident Loans, Periods 1-8

LOANS RECEIVED	LOANS MADE															
	Arlington	Belmont	Boston	Braintree	Brookline	Cambridge	Canton	Chelsea	Dedham	Everett	Lexington	Lynn	Malden	Medford	Melrose	Milton
Arlington		764	1,014		43	334				12	741		5	55		
Belmont	73		893		15	105					113		4			
Boston	39	110			7,290	759		534	262	5	77	7	53	38		364
Braintree			580			2										9
Brookline		21	5,214			139			2		41					
Cambridge	123	1,013	7,335		232			10		1	216		13	29	35	
Canton			197			4			3							43
Chelsea		11	456							84			7			
Dedham		16	464		5		2									16
Everett	4		388			5		197				1	207	5	7	
Lexington	266	118	499		13	28							4			
Lynn			502												1	2
Malden		1	768		7	25		85		118	42			79	382	
Medford	83	10	1,452			104		9		9	53		169		10	
Melrose			524		2					2	7	9	266	21		10
Milton			1,299		2	9	2		5						3	
Needham			408		3				30		6					
Newton		17	4,841		2,167	20			16		77		3			1
Quincy	2	19	2,119		13				4		1	13	11			196
Randolph			517				12	9		2						156
Revere	4		1,085		13			386		53	3	197	83		6	
Saugus	5		227					47		39		273	31		371	
Somerville	147	13	3,314		38	1,860				11	33		12	275	22	3
Waltham	24	910	1,062		7	29					833					
Watertown	6	479	935		25	164					65	1				
Wellesley	8	3	496						4		43					
Westwood			261		1	3			96		9					8
Weymouth			644								1					3
Winchester	178	15	359			12				2	293		14	50	35	
Winthrop			817					36		5	2		1			
Total Loans Made	962	3,520	38,670	no returns	9,876	3,602	16	1,313	422	343	2,656	501	883	552	872	811

Reciprocal Borrowing in the Boston Core Area (continued)
Total Non-Resident Loans, Periods 1-8

LOANS RECEIVED BY MADE

	Needham	Newton	Quincy	Randolph	Revere	Saugus	Somerville	Waltham	Watertown	Wellesley	Westwood	Weymouth	Winchester	Winthrop	Total Loans Received
Arlington							1	1	20				71		3,061
Belmont		14						5	377	18					1,617
Boston	71	353	231	17			2	14	84	56	50	22	40	8	10,486
Braintree			1,153	16						6		1,104			2,870
Brookline	24	45						12	8	13	5		8		5,530
Cambridge		96	1				3	1	63	6		3	24		9,204
Canton	3	3	110	18							12				393
Chelsea			4		14				1						577
Dedham	82								3	40	181				809
Everett						16									830
Lexington		10						2	5	3			14		962
Lynn						45		3							553
Malden		2	2		2	15							26		1,554
Medford		1					4		6	5			240		2,155
Melrose						36				6			13		896
Milton	2	2	250	6						6	3	4			1,593
Needham		20							3	1,201	7				1,678
Newton	378			1				81	252	990	14		44		8,902
Quincy				11						2		146			2,537
Randolph		5	194							5		6			906
Revere		6				145							5	6	1,992
Saugus					1										994
Somerville		1							47				24		5,800
Waltham	4	107							423			6	1		3,406
Watertown	4	129	7					5		28			26		1,874
Wellesley	441	69							1		9		22		1,096
Westwood	93	4							7	141					623
Weymouth		2	700	25						3	4				1,382
Winchester						1		12	8	4					983
Winthrop		3			1					7					872
Total Loans Made	1,102	872	2,652	94	18	258	10	136	1,306	2,540	285	1,291	558	14	76,135

CORE AREA ANALYSIS: MUNICIPALITIES RANKED BY NON-RESIDENT BORROWINGS PER CAPITA, HIGHEST TO LOWEST

Core Area: Boston

Activity Index = $\frac{\text{Total Projected Non-Resident Volume in Area}}{\text{Area Population}}$ = .254

Population Density = 6245.7 per sq. mile

Municipality (pop.)	NR Borrowings per capita	(A) Median School Yr. Completed	(B) Personal Income Per Cap. ($)	(C) Library Income Per Cap. ($)	(D) Materials Exp. Per Cap. ($)	(E) Circ. Per Cap. ($)	(F) True Value Tax Rate per $1,000	(G) Professionals (MLS) per 10,000 pop.
1. Brookline (53,150)	.676	12.9	7,690	20.35	3.11	10.02	57.65	4.14
2. Newton (89,183)	.649	12.9	7,129	10.63	1.30	6.89	53.18	1.79
3. Cambridge (102,095)	.586	12.5	5,278	11.28	1.48	5.66	68.13	1.57
4. Braintree (36,822)	.507	12.5	5,189	9.64	1.58	8.73	38.40	1.90
5. Somerville (80,596)	.468	11.6	4,278	7.45	1.10	1.79	72.39	1.49
6. Arlington (50,223)	.396	12.5	5,574	12.90	1.81	6.66	50.70	3.78
7. Waltham (56,757)	.390	12.1	4,748	6.25	.94	3.22	43.63	.88
8. Belmont (27,660)	.380	12.8	6,989	15.90	2.46	11.92	36.11	2.17
9. Milton (27,214)	.380	12.7	6,605	11.56	2.08	9.13	40.48	2.57
10. Needham (29,936)	.364	13.4	7,010	12.47	2.15	12.12	34.58	1.34
11. Watertown (36,075)	.338	12.4	5,225	14.84	2.01	6.64	57.98	2.22
12. Revere (41,292)	.314	12.0	4,492	3.16	.40	1.28	60.80	.48
13. Westwood (14,019)	.289	13.2	7,040	14.94	2.66	12.19	38.86	2.85
14. Winchester (22,672)	.282	13.4	7,169	15.94	2.39	12.12	44.04	1.76
15. Winthrop (20,359)	.278	12.4	4,868	5.70	.86	4.08	46.73	1.47
16. Wellesley (26,593)	.268	15.2	7,858	17.65	3.99	14.23	37.41	5.27

Municipality (pop.)	NR Borrowings per capita	A	B	C	D	E	F	G
17. Saugus (24,716)	.261	12.3	4,699	4.86	.80	4.03	39.30	.81
18. Medford (60,702)	.231	12.2	4,680	8.85	1.37	3.85	56.00	1.49
19. Randolph (29,206)	.202	12.5	4,830	5.18	.77	5.35	46.54	1.03
20. Dedham (26,924)	.195	12.4	5,312	11.76	2.30	6.61	36.68	2.23
21. Lexington (32,477)	.193	13.5	6,740	16.19	3.19	14.94	38.90	3.08
22. Malden (55,814)	.181	12.1	4,586	7.91	1.49	4.28	64.68	1.61
23. Melrose (32,213)	.181	12.5	5,226	9.73	1.39	7.32	47.40	.62
24. Quincy (91,487)	.180	12.3	5,057	10.83	1.29	6.39	61.13	1.53
25. Weymouth (56,854)	.158	12.4	4,869	8.26	1.13	6.12	49.13	.70
26. Chelsea (25,066)	.150	11.1	3,957	7.87	1.84	5.87	84.96	1.20
27. Canton (18,114)	.141	12.6	5,413	12.89	2.41	9.24	37.79	2.20
28. Everett (39,713)	.136	11.7	4,489	8.38	1.19	4.60	39.20	.50
29. Boston (637,986)	.107	12.1	4,157	15.07	2.14	3.75	123.92	1.65
30. Lynn (80,240)	.045	12.1	4,424	8.39	1.03	4.57	78.96	.50
Mean	.298	12.5	5,519	10.89	1.76	7.12	52.86	1.81
Standard Deviation,	.159	.727	1,157	4.19	.821	3.61	19.00	1.15
Coefficient of Variation	.533	.058	.210	.385	.467	.507	.359	.635

CORE AREA: Boston

Coefficients of Correlation (Product-Moment) Among Socioeconomic, Library Support, and Library Activity Indicators

A= Median School Year Completed
B= Personal Income Per Capita
C= Total Library Income Per Capita
D= Library Materials Expenditure Per Capita
E= Total Circulation Per Capita
F= True Value Tax Rate per $1,000
G= Graduate Professionals (MLS) per 10,000 pop.

note: relationships are linear (y=a+bx) unless otherwise noted

	A	B	C	D	E	F	G
A		.844	.629	.715	.807	-.534*	.692
B	.844		.749	.739	.839	-.562*	.700
C	.629	.749		.909	.776	-.066	.773
D	.715	.739	.909		.846	-.188	.841
E	.807	.839	.776	.846		-.497	.649
F	-.534*	-.562*	-.066	-.188	-.497		-.211
G	.692	.700	.773	.841	.649	-.211	

Underlined coefficients significant at .05 level

*curvilinear power relationship ($y=ax^b$)

Coefficients of Correlation (Point-Biserial unless otherwise noted) Between Non-Resident Borrowings Per Capita, and Socioeconomic, Library Support and Library Activity Indicators

	Non-Resident Borrowings Per Capita
Median School Year Completed	.347
Personal Income Per Capita	.458*
Total Library Income Per Capita	-.180
Materials Expenditure Per Capita	.104
Circulation Per Capita	.183
True Value Tax Rate Per $1,000	-.282
Professionals (MLS) per 10,000 pop.	.333

*linear relationship (y=a+bx)

Underlined coefficients significant at .05 level

DESCRIPTIVE ANALYSIS : BROCKTON CORE AREA

Number of Municipalities in the Core Area: 14

Non-Resident Borrowing Activity Index: Lowest of 16 core areas under study (.119)

Educational Level: Rather low and extremely homogeneous, ranging only from 12.1 median school years completed (Brockton and Bridgewater) to 12.6 (Canton).

Personal Income Level: Low and extremely homogeneous. Eleven of the 15 municipalities have per capita income figures below the statewide average of $4,755.

Total Library Income: Relatively heterogeneous with respect to this variable, with per capita library income ranging from $2.49 (Whitman) to $16.08 (East Bridgewater).

Library Materials Expenditure: Relatively homogeneous, with per capita materials expenditure figures ranging from $.65 (Whitman) to $2.87 (East Bridgewater).

True Value Tax Rate: Generally speaking, an area of relatively low tax rates. However, while 12 of the 14 municipalities had equalized tax rates less than the statewide average of $47.02 per thousand, none was less than $32.90 per thousand.

Professional Library Staffing: Residents of this core area would seem to have reasonable access to professionalism. Only 4 libraries reported no graduate professionals on their staffs during the sampling period, and 3 of these municipalities were in the under-10,000 population group where graduate professionals are not required for state aid eligibility.

The Lenders and the Borrowers (refer to page 61)

Brockton, the area's largest lender, makes approximately 44% of the non-resident loans within this area, with Stoughton accounting for an additional 25%.

An estimated 93% of Brockton's total non-resident loans are made to residents of municipalities in this core area.

Brockton is also the heaviest non-resident borrowing community, with a projected volume of 6,513 loans made to its residents by other municipalities in the core area. In relative terms, this is rather low: i.e., Brockton has 36% of the area's population, yet accounts for only 21% of non-resident borrowings.

Easton shows the highest per capita borrowing rate (.439), a rather low figure.

General Area Relationships (refer to page 63)

Correlation analysis among socio-economic, library support, and library activity indicators does not confirm certain anticipated relationships:

-there are no significant relationships between either of the socio-economic status indicators (personal income and educational level) and any of the indicators of library income, expenditure and use.

There are, however, highly significant relationships between library income and circulation (C-E) and between materials expenditure and circulation (D-E).

Non-Resident Borrowing Relationships (refer to page 63)

Correlation analysis between (a) non-resident borrowings per capita, and (b) various socio-economic, library support and library activity indicators produces no significant relationships. On the basis of these non-relationships, it may be said that:

In the Brockton Core Area, municipalities characterized as "heavy non-resident borrowers" do not tend to be significantly different in terms of socio-economic status, library support or library use than those not so characterized.

Reciprocal Borrowing in the Brockton Core Area
Total Non-Resident Loans, Periods 1-8

LOANS MADE

LOANS RECEIVED	Abington	Avon	Bridgewater	Brockton	Canton	Easton	E.Bridgewater	Halifax	Hanson	Holbrook	Randolph	Stoughton	W.Bridgewater	Whitman	Total Loans Received
Abington				161						4		3		13	181
Avon				73						9	14	54			150
Bridgewater		9		108								9			126
Brockton		209	13		4		7	3		44	41	624	9	48	1,002
Canton		11		21						2	18	227			279
Easton		42	6	607			4				14	199	15		887
E. Bridgewater		7	88	100				52				30	9		286
Halifax				114			1				1				116
Hanson	3			27				36				4	4	18	92
Holbrook		23		21							281	3			328
Randolph		334		61	12					47		63			517
Stoughton				34	20						6				60
W. Bridgewater			28	251			4								283
Whitman				573			13			5					591
Total Loans Made	3	635	135	2,151	36	0	29	91	0	111	375	1,216	37	79	4,898

CORE AREA ANALYSIS: MUNICIPALITIES RANKED BY NON-RESIDENT BORROWINGS PER CAPITA, HIGHEST TO LOWEST

Core Area: Brockton

Activity Index = Total Projected Non-Resident Volume in Area / Area Population = .119

Population Density = 1246.2 per square mile

Municipality (pop.)	NR Borrowings per capita	(A) Median School Yr. Completed	(B) Personal Income Per Cap. ($)	(C) Library Income Per Cap. ($)	(D) Materials Exp. Per Cap. ($)	(E) Circ. Per Cap. ($)	(F) True Value Tax Rate per $1,000	(G) Professionals (MLS) per 10,000 pop.
1. Easton (13,138)	.439	12.5	4,733	4.81	.96	4.94	38.20	.76
2. W.Bridgewater (6,429)	.286	12.3	4,111	8.63	2.18	6.04	38.54	1.56
3. Whitman (13,476)	.285	12.2	4,305	2.49	.65	2.67	50.04	0
4. E. Bridgewater (9,485)	.196	12.3	4,211	16.08	2.87	20.43	45.44	1.05
5. Avon (5,315)	.183	12.3	4,363	8.12	1.77	6.93	32.90	0
6. Holbrook (11,849)	.180	12.3	4,396	7.39	1.34	4.78	46.75	1.69
7. Halifax (4,684)	.161	12.3	4,105	6.33	1.57	9.10	36.85	0
8. Randolph (29,206)	.115	12.5	4,830	5.18	.77	5.35	46.54	1.03
9. Canton (18,114)	.100	12.6	5,413	12.89	2.41	9.24	37.79	2.21
10. Abington (13,456)	.087	12.4	4,613	7.77	1.76	6.58	43.35	.74
11. Hanson (8,331)	.072	12.3	4,054	3.02	.84	4.16	41.40	0
12. Brockton (95,688)	.068	12.1	4,189	6.50	1.06	5.20	60.04	.73
13. Bridgewater (13,613)	.060	12.1	4,272	10.76	2.15	7.64	43.00	2.94
14. Stoughton (25,717)	.015	12.3	4,755	8.88	2.19	7.78	36.31	1.94
Mean	.161	12.3	4,454	7.78	1.61	7.20	42.65	1.05
Standard Deviation	.114	.142	378	3.68	.693	4.24	6.95	.923
Coefficient of Variation	.710	.012	.085	.473	.431	.589	.163	.879

CORE AREA: Brockton

Coefficients of Correlation (Product-Moment) Among Socioeconomic, Library Support, and Library Activity Indicators

A= Median School Year Completed
B= Personal Income Per Capita
C= Total Library Income Per Capita
D= Library Materials Expenditure Per Capita
E= Total Circulation Per Capita
F= True Value Tax Rate per $1,000
G= Graduate Professionals (MLS) per 10,000 pop.

note: relationships are linear (y=a+bx) unless otherwise noted

	A	B	C	D	E	F	G
A		.772	.089	.043	.063	-.450	.027
B	.772		.227	.141	-.013	-.238	.400
C	.089	.227		.936	.825	-.180	.584
D	.043	.141	.936		.855*	-.393	.554
E	.063	-.013	.825	.855*		-.136	.184
F	-.450	-.238	-.180	-.393	-.136		-.057
G	.027	.400	.584	.554	.184	-.057	

Underlined coefficients significant at .05 level

*Curvilinear exponential relationship ($y=ae^{bx}$)

Coefficients of Correlation (Point-Biserial unless otherwise noted) Between Non-Resident Borrowings Per Capita, and Socioeconomic, Library Support and Library Activity Indicators

	Non-Resident Borrowings Per Capita
Median School Year Completed	-.055
Personal Income Per Capita	-.372
Total Library Income Per Capita	-.024
Materials Expenditure Per Capita	.015
Circulation Per Capita	.157
True Value Tax Rate Per $1,000	-.210
Professionals (MLS) per 10,000 pop.	-.365

Underlined coefficients significant at .05 level

DESCRIPTIVE ANALYSIS : CONCORD-LEXINGTON CORE AREA

Number of Municipalities in the Core Area: 21

Educational Level: The average of the median figures for School Years Completed for residents of municipalities in this core area is 13.3 years, second only to the Wellesley Core Area. However, this area is extremely heterogeneous with respect to this chacteristic, with values ranging from 12.1 years for Waltham and 12.2 years for Maynard to 15.2 years for Weston.

Personal Income Level: This measure being a correlate of the above, it manifests similar characteristics: on average, a high income area, but the most heterogeneous of all the core areas with respect to this characteristic.

Total Library Income: The average of per capita library income figures is the highest of all of the core areas. The area is surprisingly homogeneous with respect to this characteristic: although values range from $3.48 for Billerica to $21.18 for Lincoln and $21.85 for Concord, these values are extreme and the remainder are more closely grouped.

Library Materials Expenditure: Heterogeneous with respect to this indicator, with values ranging from $.49 for Billerica to $4.28 for Lincoln.

Professional Library Staffing: Professional staffing at an extraordinarily high level, with only 4 libraries reporting less than one professional per 10,000 population during the survey period.

The Lenders and the Borrowers (refer to page 66)

During the sampling period, Lexington accounted for 29% of the non-resident loans, Belmont 20% and Concord 12%. It should be noted, however, that current non-resident loans volumes for both Lexington and Concord are probably considerably higher, inasmuch as these municipalities gave free non-resident privileges only to residents of other municipalities in their respective Eastern Sub-Regions during all, or a portion of, the sampling period.

Almost half (47%) of Concord's non-resident loans were made to residents of Acton.

Waltham was the heaviest non-resident borrowing community, with a projected volume of 15,977 loans made to its residents by other municipalities in the area, primarily Belmont and Lexington. On a per capita basis, Boxborough was the heaviest borrower, with 84% of its loans coming from Acton.

General Area Relationships (refer to page 70)

Correlation analysis among socio-economic, library support, and library activity indicators confirms a number of significant relationships, such as:

1. Highly significant positive relationships between the socio-economic status indicators (educational level and personal income) and library circulation (A-E, B-E).

2. Significant positive relationships between socio-economic status indicators, and measures of library income and expenditure (A-C, B-C, A-D, B-D).

3. A significant positive relationship between library income and degree of professionalization (C-G).

4. Highly significant positive relationships between library income and materials expenditures (C and D) and library circulation (E).

5. Significant negative relationships between local tax rates and local educational levels (A-F) and between local tax rates and library circulation (E-F).

Non-Resident Borrowing Relationships (refer to page 70)

Correlation analysis between (a) non-resident borrowing per capita, and (b) various indicators of socio-economic status, library support and library activity, produces only one significant relationship. On the basis of that relationship, it may be said that:

In the Concord-Lexington Core Area, municipalities characterized as "heavy non-resident borrowers" tend to have significantly lower true value tax rates than municipalities not so characterized.

Reciprocal Borrowing in the Concord-Lexington Core Area
Total Non-Resident Loans, Periods 1-8

LOANS MADE

LOANS RECEIVED	Acton	Arlington	Bedford	Belmont	Billerica	Boxborough	Burlington	Cambridge	Carlisle	Concord	Lexington	Lincoln
Acton			8					12	2	955	116	2
Arlington	5			764			20	334			741	
Bedford				42			8	1		50	1,194	5
Belmont		73	24				21	105			113	8
Billerica		8	127	40			311		26		108	
Boxborough	541									108	31	
Burlington		53	16	13		2					305	
Cambridge	3	123	22	1,013							216	4
Carlisle	6		70	9						242	64	
Concord	74	3	4	5				12			129	4
Lexington	43	266	43	118			1	28		17		6
Lincoln				9				2		227	87	
Maynard	14									182	7	
Newton			1	17				20			77	4
Sudbury	20	6	1					1		227	73	49
Waltham		24	2	910				29			833	27
Watertown		6	1	479				164			65	1
Wayland										17	17	24
Weston	23		13					1		17	26	20
Winchester		178		15				12			293	
Woburn		22		3			121	3			409	
Total Loans Made	729	762	332	3,437	no returns	2	482	724	28	2,042	4,904	154

Reciprocal Borrowing in the Concord-Lexington Core Area (continued)
Total Non-Resident Loans, Periods 1-8

LOANS RECEIVED / LOANS MADE

	Maynard	Newton	Sudbury	Waltham	Watertown	Wayland	Weston	Winchester	Woburn	Total Loans Received
Acton	67		1	3						1,166
Arlington			16	1	20			71	12	1,984
Bedford	3			3	4	1			7	1,318
Belmont		14		5	377		6			746
Billerica					2			5	14	641
Boxborough	2									682
Burlington			3					40	96	528
Cambridge		96		1	63		3	24	3	1,571
Carlisle										391
Concord	9			2	3	5	9	2		261
Lexington	3	10		2	5			14		556
Lincoln						4				329
Maynard						9				212
Newton				81	252		16	44		512
Sudbury	66	9		8		311	8			779
Waltham		107			423	6	86	1	10	2,458
Watertown		129		5				26		876
Wayland	2	28	1		1		208	4		302
Weston		103		52	4	61				320
Winchester				12	8				39	557
Woburn								476		1,034
Total Loans Made	152	496	21	175	1,162	397	336	707	181	17,223

CORE AREA ANALYSIS: MUNICIPALITIES RANKED BY NON-RESIDENT BORROWINGS PER CAPITA, HIGHEST TO LOWEST

Core Area: Concord-Lexington

Activity Index= $\frac{\text{Total Projected Non-Resident Volume in Area}}{\text{Area Population}}$ = .174

Population Density= 2260.7 per square mile

Municipality (pop.)	NR Borrowings per capita	(A) Median School Yr. Completed	(B) Personal Income Per Cap. ($)	(C) Library Income Per Cap. ($)	(D) Materials Exp. Per Cap. ($)	(E) Circ. Per Cap. ($)	(F) True Value Tax Rate per $1,000	(G) Professionals (MLS) per 10,000 pop.
1. Boxborough (2,642)	1.678	NA	5,301	6.49	2.85	6.61	24.80	0
2. Carlisle (3,178)	.800	14.4	7,227	10.87	2.88	14.56	29.40	3.15
3. Bedford (12,314)	.696	12.9	5,474	13.81	2.49	8.04	34.80	5.69
4. Acton (18,209)	.416	14.1	6,111	9.72	1.74	10.52	30.60	3.30
5. Sudbury (14,951)	.339	14.6	6,342	9.53	1.68	12.19	36.48	3.34
6. Lincoln (6,374)	.335	14.9	7,384	21.18	4.28	12.97	28.37	4.71*
7. Waltham (56,757)	.281	12.1	4,748	6.25	.94	3.22	43.63	.88
8. Arlington (50,223)	.257	12.5	5,574	12.90	1.81	6.66	50.70	3.78
9. Woburn (35,329)	.190	12.4	4,691	6.77	1.00	3.80	44.60	.57
10. Weston (11,478)	.181	15.2	9,609	11.20	1.61	13.44	33.60	2.61
11. Belmont (27,660)	.176	12.8	6,989	15.90	2.46	11.92	36.11	2.17
12. Winchester (22,672)	.160	13.4	7,169	15.94	2.39	12.12	44.04	1.76
13. Watertown (36,075)	.158	12.4	5,225	14.84	2.01	6.64	57.98	2.22
14. Wayland (13,282)	.148	14.2	6,926	11.75	2.55	13.30	46.31	3.76
15. Burlington (24,306)	.141	12.5	4,665	5.17	1.54	4.40	45.86	1.23

Municipality (pop.)	NR Borrowings per capita	A	B	C	D	E	F	G
16. Maynard (9,901)	.136	12.2	4,529	6.70	1.31	4.31	43.00	4.04
17. Billerica (37,831)	.116	12.3	4,111	3.48	.49	3.08	47.40	0
18. Lexington (32,477)	.111	13.5	6,740	16.19	3.19	14.94	38.90	3.08
19. Cambridge (102,095)	.100	12.5	5,278	11.28	1.48	5.66	68.13	1.57
20. Concord (17,270)	.098	13.5	7,413	21.85	3.80	15.58	33.50	3.47
21. Newton (89,183)	.037	12.9	7,129	10.63	1.30	6.89	53.18	1.79
Mean	.312	13.3	6,125	11.55	2.09	9.09	41.50	2.53
Standard Deviation	.367	.983	1,344	4.96	.957	4.28	10.61	1.52
Coefficient of Variation	1.177	.074	.219	.429	.458	.471	.256	.601

*Figure for 6 G based on FY 1978 data. No personnel report received for FY 1977.

CORE AREA: Lexington

Coefficients of Correlation (Product-Moment) Among Socioeconomic, Library Support, and Library Activity Indicators

A= Median School Year Completed
B= Personal Income Per Capita
C= Total Library Income Per Capita
D= Library Materials Expenditure Per Capita
E= Total Circulation Per Capita
F= True Value Tax Rate per $1,000
G= Graduate Professionals (MLS) per 10,000 pop.

note: relationships are linear (y=a+bx) unless otherwise noted

	A	B	C	D	E	F	G
A		.808	.446*	.535	.812	-.637	.457
B	.808		.651**	.514	.842	-.382	.358
C	.446*	.651**		.809	.716	-.173	.571
D	.535	.514	.809		.748	-.531	.526
E	.812	.842	.716	.748		-.506	.513
F	-.637	-.382	-.173	-.531	-.506		-.269
G	.457	.358	.571	.526	.513	-.269	

Underlined coefficients significant at .05 level
*Curvilinear power relationship ($y=ax^b$)
**Curvilinear logarithmic relationship ($y=a+b \log x$)

Coefficients of Correlation (Point-Biserial unless otherwise noted) Between Non-Resident Borrowings Per Capita, and Socioeconomic, Library Support and Library Activity Indicators

	Non-Resident Borrowings Per Capita
Median School Year Completed	.410
Personal Income Per Capita	.153
Total Library Income Per Capita	-.046
Materials Expenditure Per Capita	.085
Circulation Per Capita	.091
True Value Tax Rate Per $1,000	-.696*
Professionals (MLS) per 10,000 pop.	.067

*Curvilinear power relationship ($y=ax^b$)

Underlined coefficients significant at .05 level

DESCRIPTIVE ANALYSIS : FALMOUTH CORE AREA

Number of Municipalities in Core Area: 15

Non-Resident Borrowing Activity Index: Relatively high (.307), ranking 6th of the 16 core areas.

Educational Level: Somewhat higher than average in comparison with other core areas, and very homogeneous with respect to this characteristic.

Personal Income Level: Nine of the 15 municipalities have a per capita personal income figure above the statewide per capita figure of $4,755. Although the range is from $3,706 per capita for Provincetown to $6,666 for Orleans, these values are extreme, and the remaining municipalities are more homogeneously grouped.

Total Library Income: Very heterogeneous with respect to this indicator, with values ranging from $.41 per capita for Chatham to $12.87 for Falmouth.

Library Materials Expenditure: Very heterogeneous, with per capita library materials expenditure figures ranging from $.19 for Chatham to $2.14 for Orleans.

True Value Tax Rate: An area of low equalized tax rates, with all of the municipalities well below the statewide average of $47.02 per thousand.

Professional Library Staffing: Eleven of the 15 municipalities have populations of less than 10,000, the threshold of the current ;rofessional personnel requirement for state aid eligibility. Only 4 of the 11 have graduate professionals on their library staffs. Direct access to professionalism within this core area must be characterized as "uneven".

The Lenders and the Borrowers (refer to page 73)

This area might more properly have been designated the "Barnstable-Falmouth Core Area", inasmuch as these 2 communities account for almost two-thirds (63%) of total area non-resident loans.

The heavy non-resident borrowing communities are Bourne, Dennis, Mashpee and Yarmouth. These 4 communities, with roughly one-third of the population (32%), account for over two-thirds (69%) of the non-resident borrowing.

General Area Relationships (refer to page 75)

Correlation analysis among socio-economic, library support, and library activity indicators confirms relatively few of the anticipated significant relationships. Those confirmed include:

1. Significant positive relationships between library income and library materials expenditures (C and D) and library circulation (E).

2. Highly significant negative relationships between socio-economic status indicators (educational level and personal income) and local tax rates (A-F, B-F).

Non-Resident Borrowing Relationships (refer to page 75)

Correlation analysis between (a) non-resident borrowings per capita, and (b) various indicators of socio-economic status, library support and library activity, produces 3 significant relationships. On the bases of these relationships, it may be said that:

In the Falmouth Core Area, municipalities characterized as "heavy non-resident borrowers" tend to

1) spend significantly less for library services in general, and

2) spend significantly less for library materials than municipalities not characterized as heavy non-resident borrowers.

Also,

3) Libraries in these municipalities tend to have slightly lower circulation rates than libraries in other municipalities in the core area.

Reciprocal Borrowing in the Falmouth Core Area
Total Non-Resident Loans, Periods 1-8

LOANS MADE

LOANS RECEIVED	Barnstable	Bourne	Brewster	Chatham	Dennis	Eastham	Falmouth	Harwich	Mashpee	Orleans	Provincetown	Sandwich	Truro	Wellfleet	Yarmouth	Total Loans Received
Barnstable		9					108					30			8	155
Bourne	17						1,000					114				1,131
Brewster	38	6			47			91		191					1	374
Chatham	23	5						264		84						376
Dennis	532	6	71				6	157		8				2	249	1,031
Eastham	8						29	2		162				13		214
Falmouth	14	12				12										38
Harwich	81		23				1			33		4			14	156
Mashpee	285	6					657					8				956
Orleans	19		114			5		10								148
Provincetown							12			6			25			43
Sandwich	118	29					82									229
Truro	3													86		89
Wellfleet	1					2	3			33						39
Yarmouth	708				235		37	8								988
Total Loans Made	1,847	73	208	no returns	282	19	1,935	532	no returns	517	no returns	156	25	101	272	5,967

CORE AREA ANALYSIS: MUNICIPALITIES RANKED BY NON-RESIDENT BORROWINGS PER CAPITA, HIGHEST TO LOWEST

Core Area: Falmouth

Activity Index= $\frac{\text{Total Projected Non-Resident Volume in Area}}{\text{Area Population}}$ = .307

Population Density= 321 per square mile

Municipality (pop.)	NR Borrowings per capita	(A) Median School Yr. Completed	(B) Personal Income Per Cap. ($)	(C) Library Income Per Cap. ($)	(D) Materials Exp. Per Cap. ($)	(E) Circ. Per Cap.	(F) True Value Tax Rate per $1,000	(G) Professionals (MLS) per 10,000 pop.
1. Mashpee (2,496)	2.490	ND	5,104	2.02	.69	ND	18.24	0
2. Dennis (9,351)	.717	12.6	5,042	3.31	1.08	6.38	13.20	0
3. Brewster (3,709)	.659	ND	4,887	6.54	1.19	10.42	15.44	2.70
4. Bourne (11,362)	.647	12.5	4,196	8.34	1.46	7.63	22.00	1.76
5. Eastham (3,069)	.453	ND	5,317	5.17	1.31	10.42	13.70	0
6. Truro (1,260)	.439	ND	5,180	6.76*	.90*	7.93*	12.22	7.94
7. Chatham (6,027)	.406	12.6	5,412	.41	.19	.49	12.70	ND
8. Yarmouth (17,427)	.369	12.6	4,726	3.55	.56	7.18	20.60	0
9. Sandwich (6,358)	.234	12.7	4,445	10.77	2.05	11.38	14.00	3.15
10. Orleans (4,369)	.220	13.0	6,666	10.01	2.14	14.47	11.80	2.29
11. Harwich (7,786)	.130	12.6	4,566	7.99	2.13	12.75	15.20	0
12. Wellfleet (1,973)	.128	ND	5,363	8.54	2.08	16.87	9.25	5.07
13. Provincetown (3,947)	.071	12.0	3,706	12.15	2.13	4.07	28.50	0
14. Barnstable (26,699)	.027	12.6	4,834	11.38	1.71	10.35	17.13	.75
15. Falmouth (20,648)	.012	12.5	4,533	12.87	1.65	14.90	23.52	1.45
Mean	.467	12.6	4,932	7.32	1.42	9.66	16.50	1.79
Standard Deviation	.606	.245	671	3.82	.640	4.44	5.20	2.35
Coefficient of Variation	1.297	.019	.136	.522	.451	.460	.315	1.31

* Fy 1978 Data

CORE AREA: Falmouth

Coefficients of Correlation (Product-Moment) Among Socioeconomic, Library Support, and Library Activity Indicators

A= Median School Year Completed
B= Personal Income Per Capita
C= Total Library Income Per Capita
D= Library Materials Expenditure Per Capita
E= Total Circulation Per Capita
F= True Value Tax Rate per $1,000
G= Graduate Professionals (MLS) per 10,000 pop.

note: relationships are linear (y=a+bx) unless otherwise noted

	A	B	C	D	E	F	G
A		.828	-.203	-.049	.487	-.830	.499
B	.828		-.302	-.132	.281	-.737	.258
C	-.203	-.302		.847	.669*	.341	.163
D	-.049	-.132	.847		.660	.078	.041
E	.487	.281	.669*	.660		-.074	.264
F	-.830	-.737	.341	.078	-.074		-.487
G	.499	.258	.163	.041	.264	-.487	

Underlined coefficients significant at .05 level

*Curvilinear logarithmic relationship (y=a+b log x)

Coefficients of Correlation (Point-Biserial unless otherwise noted) Between Non-Resident Borrowings Per Capita, and Socioeconomic, Library Support and Library Activity Indicators

	Non-Resident Borrowings Per Capita
Median School Year Completed	.007
Personal Income Per Capita	.085
Total Library Income Per Capita	-.813
Materials Expenditure Per Capita	-.852
Circulation Per Capita	-.569
True Value Tax Rate Per $1,000	-.104
Professionals (MLS) per 10,000 pop.	-.011

Underlined coefficients significant at .05 level

DESCRIPTIVE ANALYSIS : FITCHBURG CORE AREA

Number of Municipalities in Core Area: 15

Non-Resident Borrowing Activity Index: Very High (.395), ranging 3rd of the 16 core areas.

Educational Level: Relatively low, ranging from 10.8 median school years completed for Gardner to 12.8 years for Harvard. The figure for Harvard, however is an extreme, and the remaining municipalities are considerably more homogeneous with respect to this characteristic.

Personal Income: Inasmuch as only 3 of the 15 municipalities have a per capita income figure above the statewide per capita figure of $4,755, this would have to be characterized as a low income area.

Total Library Income: Relatively homogeneous with respect to this characteristic, with total library income ranging from $1.89 for Shirley to $11.10 for Gardner.

Library Materials Expenditure: The most homogeneous of all 16 core areas, with per capita library materials expenditures ranging from $.38 for Shirley to $2.19 for Harvard.

True Value Tax Rate: Generally speaking, an area of relatively low tax rates, with only 3 communities (Winchendon, Gardner and Fitchburg) having equalized tax rates in excess of the statewide figure of $47.02 per thousand. It must be pointed out, however, that these 3 communities contain 42% of area population.

Professional Library Staffing: As would be expected in an area where 12 of the 15 municipalities are below 10,000 population, local access to professionalism is minimal.

The Lenders and the Borrowers (refer to page 78)

The area's only significant lender, Fitchburg, accounted for 86% of the non-resident loans made within the area. Fitchburg made loans to residents of each of the 14 other core area municipalities, with Leominster, Lunenburg and Townsend accounting for 55% of the Fitchburg non-resident volume.

General Area Relationships (refer to page 80)

Correlation analysis among socio-economic, library support, and library activity indicators confirms

relatively few of the anticipated significant relationships. Those confirmed include:

1. Significant positive relationships between library income and library materials expenditure (C and D) and library circulation (E).

2. A significant negative relationship between local educational levels and local tax rates (A-F).

Non-Resident Borrowing Relationships (refer to page 80)

Correlation analysis between (a) non-resident borrowings per capita, and (b) various indicators of socio-economic status, library support and library activity, produces 2 significant relationships. On the basis of these relationships, it may be said that:

In the Fitchburg Core Area, municipalities characterized as "heavy non-resident borrowers" tend to

1) have higher educational levels, and

2) lower local tax rates

than municipalities not so characterized.

Reciprocal Borrowing in the Fitchburg Core Area
Total Non-Resident Loans, Periods 1-8

LOANS RECEIVED \ LOANS MADE	Ashburnham	Ashby	Ayer	Fitchburg	Gardner	Groton	Harvard	Leominster	Lunenburg	Pepperell	Princeton	Shirley	Townsend	Westminster	Winchendon	Total Loans Received
Ashburnham		41		778	156			16	4							995
Ashby				848				8								856
Ayer				132		8		22				1				163
Fitchburg			2		40			250	8		3					303
Gardner	1			202				11								214
Groton			21	94				4		27						146
Harvard			101	345	5			53								504
Leominster				1,926	7				39							1,972
Lunenburg				1,460				65								1,525
Pepperell			4	153		34										191
Princeton				165				23								188
Shirley			69	309		2		9	23							412
Townsend				1,098	1	11		23	2	53						1,188
Westminster				490	67			23								580
Winchendon				89	114			3								206
Total Loans Made	1	41	197	8,089	390	55	no returns	510	76	80	3	1	no returns	0	no returns	9,443

CORE AREA ANALYSIS: MUNICIPALITIES RANKED BY NON-RESIDENT BORROWINGS PER CAPITA, HIGHEST TO LOWEST

Core Area: Fitchburg

Activity Index = $\frac{\text{Total Projected Non-Resident Volume in Area}}{\text{Area Population}}$ = .395

Population Density = 369.3 per square mile

Municipality (pop.)	NR Borrowings per capita	(A) Median School Yr. Completed	(B) Personal Income Per Cap. ($)	(C) Library Income Per Cap. ($)	(D) Materials Exp. Per Cap. ($)	(E) Circ. Per Cap. ($)	(F) True Value Tax Rate per $1,000	(G) Professionals (MLS) per 10,000 pop.
1. Ashby (2,348)	2.370	ND	3,855	ND	ND	ND	36.40	ND
2. Ashburnham (3,834)	1.687	12.3	4,300	4.63	1.36	5.34	31.00	0
3. Townsend (5,125)	1.507	12.3	5,320	ND	ND	ND	30.80	ND
4. Lunenburg (8,175)	1.213	12.3	4,656	6.53	1.29	5.68	37.92	1.22
5. Harvard (3,514)	.932	12.8	4,181	7.26	2.19	9.04	34.23	2.85
6. Westminster (4,525)	.833	12.1	5,002	7.31	1.72	5.43	19.50	0
7. Princeton (2,072)	.590	ND	5,221	7.73	1.91	8.82	34.65	0
8. Shirley (4,740)	.565	12.1	4,316	1.89	.38	2.95	38.16	0
9. Leominster (35,429)	.362	11.8	4,574	6.93	1.37	9.15	37.44	.85
10. Winchendon (6,855)	.195	11.1	3,980	3.84	1.13	3.72	50.05	0
11. Pepperell (6,745)	.184	12.2	3,917	7.18	1.72	7.87	30.00	0
12. Groton (5,497)	.173	12.5	4,522	9.34	1.72	7.23	32.40	0
13. Ayer (6,718)	.158	12.3	3,872	4.61	1.33	4.38	36.12	1.49
14. Gardner (19,349)	.072	10.8	4,425	11.10	1.43	5.32	50.76	.52
15. Fitchburg (39,070)	.050	11.4	4,228	10.00	2.01	7.69	54.21	1.79
Mean	.726	12.0	4,425	6.80	1.51	6.36	36.91	.671
Standard Deviation	.697	.574	467.9	2.57	.461	2.08	8.96	.921
Codfficient of Variation	.959	.048	.106	.378	.306	.327	.243	1.373

CORE AREA: Fitchburg

Coefficients of Correlation (Product-Moment) Among Socioeconomic, Library Support, and Library Activity Indicators

A= Median School Year Completed
B= Personal Income Per Capita
C= Total Library Income Per Capita
D= Library Materials Expenditure Per Capita
E= Total Circulation Per Capita
F= True Value Tax Rate per $1,000
G= Graduate Professionals (MLS) per 10,000 pop.

note: relationships are linear (y=a+bx) unless otherwise noted

	A	B	C	D	E	F	G
A		.146	-.476	.194	.268	-.750	.236
B	.146		.294	.192	.285	-.361	-.280
C	-.476	.294		.710	.582	.198	.175
D	.194	.192	.710		.781	-.131	.428
E	.268	.285	.582	.781		-.139	.353
F	-.750	-.361	.198	-.131	-.139		.253
G	.236	-.280	.175	.428	.353	.253	

Underlined coefficients significant at .05 level.

Coefficients of Correlation (Point-Biserial unless otherwise noted) Between Non-Resident Borrowings Per Capita, and Socioeconomic, Library Support and Library Activity Indicators

Non-Resident Borrowings Per Capita

Median School Year Completed	.633*
Personal Income Per Capita	.429
Total Library Income Per Capita	-.339
Materials Expenditure Per Capita	-.056
Circulation Per Capita	-.067
True Value Tax Rate Per $1,000	-.614**
Professionals (MLS) per 10,000 pop.	.011

*Curvilinear power relationship ($y=ax^b$)

**Curvilinear logarithmic relationship ($y=a+b\log x$)

Underlined coefficients significant at .05 level

DESCRIPTIVE ANALYSIS : GREENFIELD CORE AREA

Number of Municipalities in Core Area: 18

Non-Resident Borrowing Activity Index: The highest of all the 16 core areas (.584).

Educational Level: Not sufficient data (NSD). "Median School Year Completed" figure not available for municipalities of under 2,000 population (1970 census).

Personal Income Level: Very low. Only one municipality (Conway) exceeds the statewide per capita personal income figure of $4,755.

Total Library Income: Relatively heterogeneous, even without the extreme Rowe figure ($36.35 per capita). Ten of the 18 municipalities had per capita income figures of less than $6.00 during the survey period.

Library Materials Expenditure: Relatively heterogeneous, even without the extreme Rowe figure.

True Value Tax Rate: An area of relatively low equalized tax rates, with only 2 municipalities exceeding the statewide average of $47.02 per thousand.

Professional Library Staffing: Library annual report data for the survey period indicates only one one graduate professional degree holder in the area.

The Lenders and the Borrowers (refer to page 83)

The area's only heavy lender, Greenfield, made 94% of the area's non-resident loans, lending to each of the area's 17 other municipalities.

General Area Relationships (refer to page 86)

Correlation analysis among socio-economic, library support and library activity indicators confirms only a few of the anticipated significant relationships:

1) Highly significant positive relationships between library income and library materials expenditures (C and D) and library circulation (E).

Non-Resident Borrowing Relationships (refer to page 86)

Correlation analysis between (a) non-resident borrowings per capita, and (b) various socio-economic, library support and library activity indicators, produces only one significant relationship. On the basis of that relationship, it may be said that:

In the Greenfield Core Area, municipalities characterized as "heavy non-resident borrowers" tend to have significantly lower true value tax rates than municipalities not so characterized.

Reciprocal Borrowing in the Greenfield Core Area
Total Non-Resident Loans, Periods 1-8

LOANS MADE

LOANS RECEIVED	Ashfield	Bernardston	Buckland	Charlemont	Colrain	Conway	Deerfield	Gill	Greenfield	Heath	Leverett	Leyden	Montague	Northfield	Orange	Rowe	Shelburne	Wendell	Total Loans Received
Ashfield							1		241								8		250
Bernardston									508										508
Buckland	29								35										64
Charlemont									316	2							101		419
Colrain									201								5		206
Conway	3						1		190								20		214
Deerfield						11			631								12		654
Gill									269				29						298
Greenfield							12						10				20		42
Heath									75								1		76
Leverett									84				20						104
Leyden									81										81
Montague									733										733
Northfield									456				4						460
Orange									120									4	124
Rowe									99										99
Shelburne							6		635										641
Wendell									36										36
Total Loans Made	32	no returns	no returns	no returns	0	11	20	no returns	4,710	2	0	0	63	0	no returns	0	167	4	5,009

CORE AREA ANALYSIS: MUNICIPALITIES RANKED BY NON-RESIDENT BORROWINGS PER CAPITA, HIGHEST TO LOWEST

Core Area: Greenfield

Activity Index= $\frac{\text{Total Projected Non-Resident Volume in Area}}{\text{Area Population}}$ = .584

Population Density= 116.1

Municipality (pop.)	NR Borrowings per capita	(A) Median School Yr. Completed	(B) Personal Income Per Cap. ($)	(C) Library Income Per Cap. ($)	(D) Materials Exp. Per Cap. ($)	(E) Circ. Per Cap. ($)	(F) True Value Tax Rate per $1,000	(G) Professionals (MLS) per 10,000 pop.
4. Bernardston (1,776)	1,859	ND	3,850	ND	ND	ND	32.00	ND
1. Charlemont (1,050)	2.594	ND	4,618	2.81	1.00	12.38	20.00	0
2. Shelburne (1,976)	2.106	ND	4,267	10.26	2.38	13.00	31.20	0
3. Rowe (313)	2.054	ND	3,791	36.35	8.01	36.41	7.20	0
5. Gill (1,276)	1.521	ND	4,313	ND	ND	ND	24.80	ND
6. Conway (1,152)	1.209	ND	4,857	10.60	1.15	13.02	28.13	0
7. Northfield (2,470)	1.209	12.7	4,574	13.39	1.80	10.76	22.57	0
8. Heath (423)	1.170	ND	3,588	4.99	2.22	9.68	18.10	0
9. Leyden (452)	1.164	ND	3,919	4.64	1.23	11.06	25.23	0
10. Ashfield (1,420)	1.144	ND	4,269	7.43	1.44	9.43	17.02	0
11. Deerfield (4,255)	1.001	12.4	4,532	4.12	1.45	6.15	18.53	0
12. Colrain (1,493)	.871	ND	3,706	4.03	.82	8.96	20.91	0
13. Montague (8,321)	.572	12.0	4,170	4.41	.54	6.45	38.50	0
14. Leverett (1,281)	.527	ND	4,582	2.48*	.51*	4.13*	28.00	ND
15. Wendell (631)	.371	ND	2,936	4.95	1.32	ND	ND	0

Municipality (pop.)	NR Borrowings per capita	A	B	C	D	E	F	G
16. Buckland (1,889)	.221	ND	4,094	5.58	1.12	3.70	37.40	0
17. Orange (6,445)	.124	12.0	3,829	5.37	1.02	8.08	48.40	0
18. Greenfield (19,087)	.013	12.3	4,576	7.90	1.81	10.63	47.73	.52
Mean	1.149	NSD	4,137	8.08	1.74	10.92	27.40	NSD
Standard Deviation	.817	NSD	474.6	8.12	1.75	7.64	10.97	NSD
Coefficient of Variation	.711	NSD	.115	1.005	1.008	.700	.400	NSD

* 1978 data

CORE AREA: Greenfield

Coefficients of Correlation (Product-Moment) Among Socioeconomic, Library Support, and Library Activity Indicators

A= Median School Year Completed
B= Personal Income Per Capita
C= Total Library Income Per Capita
D= Library Materials Expenditure Per Capita
E= Total Circulation Per Capita
F= True Value Tax Rate per $1,000
G= Graduate Professionals (MLS) per 10,000 pop.

note: relationships are linear (y=a+bx) unless otherwise noted

	A	B	C	D	E	F	G
A		NSD	NSD	NSD	NSD	NSD	NSD
B	NSD		-.055	-.195	-.217	.101	NSD
C	NSD	-.055		.949	.932	-.420	NSD
D	NSD	-.195	.949		.939	-.491	NSD
E	NSD	-.217	.932	.939		-.502	NSD
F	NSD	.101	-.420	-.491	-.502		NSD
G	NSD	NSD	NSD	NSD	NSD	NSD	

Underlined coefficients significant at .05 level

Coefficients of Correlation (Point-Biserial unless otherwise noted) Between Non-Resident Borrowings Per Capita, and Socioeconomic, Library Support and Library Activity Indicators

	Non-Resident Borrowings Per Capita
Median School Year Completed	NSD
Personal Income Per Capita	.163
Total Library Income Per Capita	.292
Materials Expenditure Per Capita	.314
Circulation Per Capita	.415
True Value Tax Rate Per $1,000	-.768
Professionals (MLS) per 10,000 pop.	NSD

Underlined coefficients significant at .05 level

NSD = Not sufficient data for meaningful computation

DESCRIPTIVE ANALYSIS : LYNNFIELD-SALEM CORE AREA

Number of Municipalities in Core Area: 18

Non-Resident Borrowing Activity Index: Relatively low (.227), ranking 11th of the 16 core areas.

Educational Level: Relatively high, but heterogeneous with respect to this characteristic. Median School Years Completed indicator ranging from 12.0 years for Salem to 13.8 years for Topsfield.

Personal Income Level: Eleven of the 18 municipalities exceed the statewide per capita income figure of $4,755. Heterogeneous with respect to this characteristic, with values ranging from $4,238 for Wilmington to $7,429 for Marblehead.

Total Library Income: The most homogeneous of all the core areas, with values ranging from $4.86 per capita for Saugus to $13.21 for Wakefield.

Library Materials Expenditure: Homogeneous, with values ranging from $.80 for Saugus to $3.70 for Lynnfield.

True Value Tax Rate: Relatively high, with 4 of the 18 municipalities having tax rates in excess of the statewide average of $47.02 per thousand. These 4 municipalities contain 40% of area population.

Professional Library Staffing: Professional staffing at a high level, with only 1 library serving a population of over 10,000 reporting no graduate professional staff during the survey period.

The Lenders and the Borrowers (refer to page 89)

Three heavy lending municipalities (Lynnfield, Salem and Danvers) accounted for 71% of the total non-resident loans within the area.

Peabody was by far the heaviest borrowing community, with its residents accounting for a projected 40,500 (46%) of total non-resident borrowings during the survey period.

General Area Relationships (refer to page 92)

Correlation analysis among socioeconomic, library support, and library activity indicators confirms

a number of significant relationships, such as:

1) Highly significant positive relationships between socioeconomic status indicators (educational level and personal income) and library circulation (A-E, B-E).

2) A significant positive relationship between library materials expenditures and library circulation (D-E).

3) Significant negative relationships between local tax rates (F) and socioeconomic status indicators (A and B); and a concomitant negative relationship between tax rates and library circulation (E-F).

Non-Resident Borrowing Relationships (refer to page 92)

Correlation analysis between (a) non-resident borrowers per capita, and (b) various socioeconomic, library support and library activity indicators produces 2 significant relationships. Based on these relationships it may be said that:

In the Lynnfield-Salem Core Area, municipalities characterized as "heavy non-resident borrowers" tend to

1) spend less (per capita) for library services, and

2) have lower equalized tax rates

than municipalities not characterized as heavy non-resident borrowers.

Reciprocal Borrowing in the Lynnfield-Salem Core Area
Total Non-Resident Loans, Periods 1-8

LOANS RECEIVED / LOANS MADE

	Beverly	Danvers	Hamilton	Lynn	Lynnfield	Marblehead	Middleton	Nahant	No. Reading	Peabody	Reading	Salem	Saugus	Swampscott	Topsfield	Wakefield	Wenham	Wilmington	Total Loans Received
Beverly		254	5						1		11	519		1	19		29	4	843
Danvers	127			39	20				1			326	6		24		2		539
Hamilton	114	151									3	67			1		215		552
Lynn	38	30			111			36				456	45	257		25			998
Lynnfield				67			2		14		75	3				338		3	502
Marblehead	17	6		20				8				318		21					390
Middleton		168		4	22							8	1		89	20			312
Nahant				211	4							46		8					269
No. Reading		1			15						226			1		53		24	320
Peabody	89	925		186	3,374		7				3	1,583		1	2	42		19	6,231
Reading		7			39				19			2				308		11	386
Salem	47	151		52	6						4		15	25					300
Saugus	17			273	89				2		3	53		6		24			467
Swampscott	1	22		95				14				324							456
Topsfield	15	278	13		23				3		3	32					2		369
Wakefield		2		1	88						210	31						2	334
Wenham	128	94	1								3	16			37				279
Wilmington	6			2	24				3		84					15			134
Total Loans Made	599	2,089	19	945	3,815	no returns	9	58	43	no returns	625	3,784	67	320	172	825	248	63	13,681

CORE AREA ANALYSIS: MUNICIPALITIES RANKED BY NON-RESIDENT BORROWINGS PER CAPITA, HIGHEST TO LOWEST

Core Area: Lynnfield-Salem

Activity Index= $\frac{\text{Total Projected Non-Resident Volume in Area}}{\text{Area Population}}$ = .227

Population Density= 2057.2 per square mile

Municipality (pop.)	NR Borrowings per capita	(A) Median School Yr. Completed	(B) Personal Income Per Cap. ($)	(C) Library Income Per Cap. ($)	(D) Materials Exp. Per Cap. ($)	(E) Circ. Per Cap. ($)	(F) True Value Tax Rate per $1,000	(G) Professionals (MLS) per 10,000 pop.
1. Peabody (45,503)	.890	12.4	4,799	6.44	1.62	3.67	41.64	1.32
2. Wenham (3,359)	.540	13.0	7,128	8.40	1.89	10.32	29.39	0
3. Hamilton (6,675)	.538	12.7	5,406	7.60	1.59	8.07	28.00	1.50
4. Middleton (4,032)	.503	12.1	4,301	9.29	2.10	6.76	32.70	0
5. Nahant (4,229)	.433	12.6	5,956	8.27	2.06	10.87	33.46	2.37
6. Topsfield (5,913)	.406	13.8	5,999	10.17	2.32	11.41	31.00	3.38
7. Lynnfield (12,009)	.272	12.9	6,590	10.72	3.70	12.71	27.40	3.33
8. Swampscott (14,329)	.207	12.8	6,731	11.94	2.17	7.73	51.54	2.09
9. N. Reading (12,125)	.172	12.5	4,704	6.20	1.24	5.10	39.48	.83
10. Beverly (37,382)	.147	12.4	5,044	11.06	2.62	7.77	45.30	1.07
11. Danvers (25,007)	.140	12.4	4,689	10.63	2.23	5.96	34.30	0
12. Saugus (24,716)	.123	12.3	4,699	4.86	.80	4.03	39.30	.81
13. Marblehead (21,574)	.118	13.3	7,429	12.92	2.70	11.98	32.13	1.85
14. Reading (23,696)	.106	12.7	5,518	10.43	2.18	9.71	43.51	1.69
15. Wakefield (26,041)	.083	12.4	5,360	13.21	2.14	6.03	49.88	2.30

Municipality (pop.)	NR Borrowings per capita	A	B	C	D	E	F	G
16. Lynn (80,240)	.081	12.1	4,424	8.39	1.03	4.57	78.96	.50
17. Salem (38,545)	.051	12.0	4,367	11.63	2.73	6.26	48.25	1.04
18. Wilmington (17,656)	.049	12.6	4,238	10.55	3.14	6.23	43.20	2.27
Mean	.270	12.6	5,410	9.60	2.13	7.79	40.52	1.46
Standard Deviation	.232	.444	1,015	2.34	.721	2.88	12.25	1.04
Coefficient of Variation	.858	.035	.188	.244	.339	.370	.302	.712

CORE AREA: Lynnfield-Salem

Coefficients of Correlation (Product-Moment) Among Socioeconomic, Library Support, and Library Activity Indicators

A= Median School Year Completed
B= Personal Income Per Capita
C= Total Library Income Per Capita
D= Library Materials Expenditure Per Capita
E= Total Circulation Per Capita
F= True Value Tax Rate per $1,000
G= Graduate Professionals (MLS) per 10,000 pop.

note: relationships are linear (y=a+bx) unless otherwise noted

	A	B	C	D	E	F	G
A		.749	.223	.300	.739	-.494	.592
B	.749		.596	.295	.784	-.519*	.399
C	.223	.596		.643	.419	.008	.368
D	.300	.295	.643		.577	-.357	.521
E	.739	.784	.419	.577		-.524	.539
F	-.494	-.519*	.088	-.357	-.524		-.181
G	.592	.399	.368	.521	.539	-.181	

Underlined coefficients significant at .05 level

*Curvilinear power relationship ($y=ax^b$)

Coefficients of Correlation (Point-Biserial unless otherwise noted) Between Non-Resident Borrowings Per Capita, and Socioeconomic, Library Support and Library Activity Indicators

	Non-Resident Borrowings Per Capita
Median School Year Completed	.339
Personal Income Per Capita	.267
Total Library Income Per Capita	-.682
Materials Expenditure Per Capita	.065
Circulation Per Capita	.378
True Value Tax Rate Per $1,000	-.576
Professionals (MLS) per 10,000 pop.	.319

Underlined coefficients significant at .05 level

Number of Municipalities in Core Area: 11 (smallest of the 16 core areas).

Non-Resident Borrowing Activity Index: Low (.135), ranking 14th of the 16 core areas.

Educational Level: High (12.7 median school years completed), but relatively heterogeneous with respect to this characteristic, with values ranging from 12.2 years (Hudson and Maynard) to 14.6 years (Sudbury).

Personal Income Level: Relatively homogeneous, with per capita personal income exceeding the statewide per capita figure of $4,755 in 6 municipalities and falling below it in 5 municipalities.

Total Library Income: One of the most homogeneous of all the core areas with respect to this characteristic, with values ranging from $4.48 per capita for Berlin to $11.36 per capita for Northborough.

Library Materials Expenditure: The second most homogeneous of all the core areas, with values ranging from $1.03 per capita for Bolton to $2.46 per capita for Northborough.

True Value Tax Rate: An area of relatively low tax rates, with 1 municipality (Hudson) exceeding the statewide average of $50.63.

Professional Library Staffing: Satisfactory access to professionalism, with only 2 municipalities, both under 10,000 population, reporting no professional staff members during the survey period.

The Lenders and the Borrowers (refer to page 95)

Marlborough, the area's heaviest lender, made a projected total of 16,543 non-resident loans within the area during the sample year, this representing 70% of the area total. Hudson was the heaviest borrower, accounting for 37% (6,039) of Marlborough's non-resident loans.

General Area Relatioships (refer to page 97)

Correlation analysis among socioeconomic, library support and library activity indicators confirms a number of anticipated significant relationships, such as:

1) Significant positive relationships between socioeconomic status indicators (educational level and personal income) and library circulation. (A-E, B-E).

2) Significant positive relationships between fiscal indicators (library income and library materials expenditures) and circulation (C-E, D-E).

Non-Resident Borrowing Realtionships (refer to page 97)

Correlation analysis between (a) non-resident borrowings per capita, and (b) various socioeconomic, library support and library activity indicators produces no significant relationships. On the basis of these non-relationships, it may be said that:

In the Marlborough Core Area, municipalities characterized as "heavy non-resident borrowers" do not tend to be significantly dirrerent in terms of socioeconomic status, library support or library use than those municipalities not so characterized.

Reciprocal Borrowing in the Marlborough Core Area
Total Non-Resident Loans, Periods 1-8

LOANS MADE

LOANS RECEIVED

	Berlin	Bolton	Framingham	Hudson	Marlborough	Maynard	Northborough	Southborough	Stow	Sudbury	Westborough	Total Loans Received
Berlin					65		8					73
Bolton					132				51			183
Framingham					127	3		35		47	1	213
Hudson		4	2		929	7			11	1		954
Marlborough		12	67			1	1	45		18		144
Maynard					7				4			11
Northborough	1		47		426					5	37	516
Southborough			86		447		6				11	550
Stow		2	14		41	24						81
Sudbury			388		259	66						713
Westborough			17		112	1	55	38				223
Total Loans Made	1	18	621	no returns	2,545	102	70	118	66	71	49	3,661

CORE AREA ANALYSIS: MUNICIPALITIES RANKED BY NON-RESIDENT BORROWINGS PER CAPITA, HIGHEST TO LOWEST

Core Area: Marlborough

Activity Index = $\frac{\text{Total Projected Non-Resident Volume in Area}}{\text{Area Population}}$ = .135

Population Density = 929.4 per square mile

Municipality (pop.)	NR Borrowings per capita	(A) Median School Yr. Completed	(B) Personal Income Per Cap. ($)	(C) Library Income Per Cap. ($)	(D) Materials Exp. Per Cap. ($)	(E) Circ. Per Cap. ($)	(F) True Value Tax Rate per $1,000	(G) Professionals (MLS) per 10,000 pop.
1. Southborough (6,326)	.565	12.6	5,710	9.04	2.64	8.87	33.00	0
2. Bolton (2,427)	.490	ND	5,306	4.53	1.03	4.98	30.25	0
3. Hudson (16,827)	.369	12.2	4,418	7.45	1.13	3.97	50.63	1.19
4. Northborough (10,563)	.318	12.6	4,905	11.36	2.46	8.87	36.90	2.84
5. Sudbury (14.951)	.310	14.6	6,342	9.53	1.68	12.19	36.48	3.34
6. Berlin (2,280)	.208	ND	4,430	4.48	1.16	4.44	34.40	4.39
7. Stow (4,688)	.112	12.6	5,556	7.68	1.40	8.70	35.70	2.13
8. Westborough (13,954)	.104	12.5	4,218	7.90	1.42	7.50	31.82	.72
9. Marlborough (30,249)	.031	12.3	4,643	7.90	1.34	9.24	45.08	.99
10. Framingham (65,564)	.021	12.7	5,556	10.71	1.72	9.03	37.82	2.29
11. Maynard (9,901)	.007	12.2	4,529	6.70	1.31	4.31	43.00	4.04
Mean	.230	12.7	5,058	7.94	1.57	7.46	37.74	1.99
Standard Deviation	.194	.737	679.4	2.20	.529	2.66	6.16	1.54
Coefficient of Variation	.844	.058	.134	.277	.337	.357	.163	.775

CORE AREA: Marlborough

COEFFICIENTS OF CORRELATION (PRODUCT-MOMENT) AMONG SOCIOECONOMIC, LIBRARY SUPPORT, AND LIBRARY ACTIVITY INDICATORS

A= Median School Year Completed
B= Personal Income Per Capita
C= Total Library Income Per Capita
D= Library Materials Expenditure Per Capita
E= Total Circulation Per Capita
F= True Value Tax Rate per $1,000
G= Graduate Professionals (MLS) per 10,000 pop.

note: relationships are linear (y=a+bx) unless otherwise noted

	A	B	C	D	E	F	G
A		.768	.376	.161	.743	-.346	.345
B	.768		.390	.405	.696	-.345	-.054
C	.376	.390		.744	.722	.110	.002
D	.161	.405	.744		.656*	-.246	-.107
E	.743	.696	.722	.656*		-.221	-.058
F	-.346	-.345	.110	-.246	-.221		.150
G	.345	-.054	.002	-.107	-.058	.150	

Underlined coefficients significant at .05 level

*Curvilinear power relationship ($y=ax^b$)

COEFFICIENTS OF CORRELATION (POINT-BISERIAL UNLESS OTHERWISE NOTED) BETWEEN NON-RESIDENT BORROWINGS PER CAPITA, AND SOCIOECONOMIC, LIBRARY SUPPORT AND LIBRARY ACTIVITY INDICATORS

	Non-Resident Borrowings Per Capita
Median School Year Completed	.354
Personal Income Per Capita	.219
Total Library Income Per Capita	-.107
Materials Expenditure Per Capita	.247
Circulation Per Capita	-.125
True Value Tax Rate Per $1,000	-.147
Professionals (MLS) per 10,000 pop.	-.024

Underlined coefficients significant at .05 level

DESCRIPTIVE ANALYSIS : NORTHAMPTON CORE AREA

Number of Municipalities in Core Area: 17

Non-Resident Borrowing Activity Index: .285

Educational Level: Data inconclusive with respect to this indicator, inasmuch as the Median School Year figure is not available for the 9 communities with populations of under 2,000 (1970 federal census).

Personal Income Level: A low income area, with only 3 municipalities having a per capits personal figure above the statewide per capita figure of $4,755.

Total Library Income: The $13.02 figure for Amherst represents an extreme value. The remaining municipalities reported figures considerably lower and relatively homogeneous in distribution.

Library Materials Expenditure: Relatively heterogeneous, with per capita library expenditures ranging from $.64 for Easthampton to $2.67 for Goshen.

True Value Tax Rate: An area of low equalized tax rates, with only 1 municipality (Holyoke) having a rate in excess of the statewide figure of $42.02 per thousand. It should be pointed out , however, that Holyoke contains approximately 31% of the total area population.

Professional Library Staffing: Minimal local access to professionalism, with the exception of Amherst, Northampton and South Hadley.

The Lenders and the Borrowers (refer to page 100)

Three major lenders account for 98% of the non-resident loans made within this area:

Municipality	Projected NR Loans	%
Northampton	28,438	66
South Hadley	7,891	18
Amherst	6,012	14
		98

It should be pointed out, however, that while the above totals represent 90% of Northampton's non-resident loans, they represent only 60% of South Hadley's non-resident loans and a mere 34% of Amherst's.

The single largest borrowing community is Holyoke with a projected 7,722 borrowings, 89% from South Hadley.

General Area Relationships (refer to page 103)

Correlation Analysis among socioeconomic, library support, and library activity indicators confirms only 2 significant relationships:

1) An expected positive relationship between per capita library income (C) and per capita expenditure for library materials (D).

2) A positive relationship between library materials expenditure per capita (D) and per capita circulation (E).

Non-Resident Borrowing Relationships (refer to page 103)

Correlation analysis between (a) non-resident borrowings per capita, and (b) various indicators of socio-economic status, library support and library activity produces only 1 significant relationship. On the basis of that relationship, it may be said that:

In the Northampton Core Area, municipalities characterized as "heavy non-resident borrowers" tend to have significantly lower equalized tax rates than municipalities not so characterized.

Reciprocal Borrowing in the Northampton Core Area
Total Non-Resident Loans, Periods 1-8

LOANS RECEIVED	LOANS MADE																	
	Amherst	Ashfield	Chesterfield	Cummington	Easthampton	Goshen	Hadley	Hatfield	Holyoke	Huntington	Northampton	S. Hadley	Southampton	Sunderland	Westhampton	Whately	Williamsburg	Total Loans Received
Amherst								1			791	72				1		865
Ashfield	15										196	5						216
Chesterfield	9										66							75
Cummington		1									196							197
Easthampton	1		3								858	20	8		2			892
Goshen		2									17							19
Hadley	515										331	6						852
Hatfield	13										529	15				3		560
Holyoke	3		1								129	1,052	3					1,188
Huntington								10			62							72
Northampton	117							72				36						225
S. Hadley	18										74							92
Southampton											259	3			4			266
Sunderland	186										38		4					228
Westhampton											169	5	9					183
Whately	27										56							83
Williamsburg	21		4								604							629
Total Loans Made	925	3	8	0	no returns	no returns	no returns	83	no returns	no returns	4,375	1,214	24	no returns	6	4	no returns	6,642

CORE AREA ANALYSIS: MUNICIPALITIES RANKED BY NON-RESIDENT BORROWINGS PER CAPITA, HIGHEST TO LOWEST

Core Area: Northampton Activity Index= $\frac{\text{Total Projected Non-Resident Volume in Area}}{\text{Area Population}}$ = .285 Population Density=371.7 per sq. mile

Municipality (pop.)	NR Borrowings per capita	(A) Median School Yr. Completed	(B) Personal Income Per Cap. ($)	(C) Library Income Per Cap. ($)	(D) Materials Exp. Per Cap. ($)	(E) Circ. Per Cap. ($)	(F) True Value Tax Rate per $1,000	(G) Professionals (MLS) per 10,000 pop.
1. Cummington (651)	1.967	ND	4,305	3.91	1.61	6.75	26.04	.00
2. Williamsburg (2,292)	1.784	ND	4,513	ND	ND	ND	34.05	ND
3. Hadley (3,802)	1.457	12.3	5,109	4.03	.85	3.17	19.00	.00
4. Westhampton (946)	1.257	ND	3,787	5.42	2.09	8.12	25.18	.00
5. Hatfield (3,090)	1.178	12.3	4,794	4.81	1.43	10.06	23.37	.00
6. Ashfield (1,420)	.989	ND	4,269	7.43	1.44	9.43	17.02	.00
7. Chesterfield (887)	.550	ND	3,177	6.06	1.34	17.38	29.14	.00
8. Sunderland (2,753)	.536	ND	4,427	2.86	.79	3.61	13.02	.00
9. Whately (1,171)	.461	ND	4,916	8.46	1.75	17.68	21.97	.00
10. Southampton (3,770)	.456	11.6	4,712	5.77	1.17	6.55	26.00	.00
11. Easthampton (15,084)	.384	11.4	4,383	4.16*	.64*	6.16*	41.60	.66
12. Huntington (1,730)	.270	ND	3,733	3.56	.97	4.38	42.63	.00
13. Amherst (22,308)	.252	15.5	3,774	13.02	1.77	9.37	35.16	1.79
14. Goshen (621)	.199	ND	3,478	5.68	2.67	9.66	21.12	.00
15. Holyoke (46,790)	.165	11.6	4,096	4.75	.65	2.63	81.34	.21

Municipality (pop.)	NR Borrowings per capita	A	B	C	D	E	F	G
16. Northampton (27,695)	.053	12.1	4,082	10.21	1.92	9.85	42.16	1.81
17. S. Hadley (16,568)	.036	12.2	4,329	8.11	1.60	7.99	34.78	1.81
Mean	.706	12.4	4,228	6.14	1.44	8.29	31.41	.39
Standard Deviation	.614	1.31	519.5	2.71	.579	4.35	15.68	.72
Coefficient of Variation	.869	.106	.123	.441	.402	.525	.499	1.85

*FY 1978 data

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CORE AREA: Northampton

COEFFICIENTS OF CORRELATION (PRODUCT-MOMENT) AMONG SOCIOECONOMIC, LIBRARY SUPPORT, AND LIBRARY ACTIVITY INDICATORS

A= Median School Year Completed
B= Personal Income Per Capita
C= Total Library Income Per Capita
D= Library Materials Expenditure Per Capita
E= Total Circulation Per Capita
F= True Value Tax Rate per $1,000
G= Graduate Professionals (MLS) per 10,000 pop.

note: relationships are linear (y=a+bx) unless otherwise noted

	A	B	C	D	E	F	G
A	NSD	NSD	NSD	NSD	NSD	NSD	NSD
B	NSD		-.166	-.330	-.227	-.223	NSD
C	NSD	-.166		.510	.480	.057	NSD
D	NSD	-.330	.510		.513	-.333	NSD
E	NSD	-.227	.480	.513		-.296	NSD
F	NSD.	-.223	.057	-.333	-.296		NSD
G	NSD	NSD	NSD	NSD	NSD	NSD	NSD

Underlined coefficients significant at .05 level

COEFFICIENTS OF CORRELATION (POINT-BISERIAL UNLESS OTHERWISE NOTED) BETWEEN NON-RESIDENT BORROWINGS PER CAPITA, AND SOCIOECONOMIC, LIBRARY SUPPORT AND LIBRARY ACTIVITY INDICATORS

	Non-Resident Borrowings Per Capita
Median School Year Completed	NSD
Personal Income Per Capita	.459.
Total Library Income Per Capita	-.419
Materials Expenditure Per Capita	-.250
Circulation Per Capita	.178
True Value Tax Rate Per $1,000	-.556
Professionals (MLS) per 10,000 pop.	NSD

Underlined coefficients significant at .05 level

DESCRIPTIVE ANALYSIS - PITTSFIELD CORE AREA

Number of Municipalities in Core Area: 18

Non-Resident Borrowing Activity Index: Rather high (.330), ranking 5th of the 16 core areas.

Educational Level: Not sufficient data to generalize with respect to this characteristic, inasmuch as Median School Years Completed figures are not available for 8 of these municipalities.

Personal Income Level: Best characterized as "average" in this respect. Seven of the 18 communities have per capita personal income figures in excess of the statewide figure of $4,755.

Total Library Income: Low and extremely heterogeneous, with 2 of the municipalities in this area not supporting local public library services (New Ashford and Washington).

Library Materials Expenditure: Low and heterogeneous

True Value Tax Rate: As would be expected, tax rates in the smaller communities are all considerably lower than the statewide figure of $47.02. However, the area's 2 largest municipalities (North Adams and Pittsfield), containing 54% of the area's population, carry a reasonably high tax burden.

Professional Library Staffing: Very limited local access to professionalism.

The Lenders and the Borrowers (refer to page 106)

The area's two major lenders account for 71% of total area non-resident loans: Pittsfield (42%) and Lenox (29%). The largest single block of non-resident loans, however (a projected 5,837 loans for the survey year), were by residents of Cheshire from the Adams public library.

It must also be pointed out that both Lenox and Pittsfield have total non-resident loan volumes considerably in excess of this area activity.

General Area Relationships (refer to page 109)

Correlation analysis among socioeconomic, library support and library activity indicators confirms several significant relationships:

1) As would be expected, a highly significant positive relationship betweem total library income per capita and library materials expenditure per capita (C-D).

2) Significant positive relationships between the local true value tax rate (F), and library fiscal indicators (C and D). This is 1 of only 2 core areas in which local tax effort is positively related to the amounts of money that local libraries receive and spend.

Non-Resident Borrowing Relationships (refer to page 109)

Correlation analysis between (a) non-resident borrowings per capita, and (b) various indicators of socio-economic status, library support and library activity produces 3 significant relationships. Based on these relationships, it may be said that:

In the Pittsfield Core Area, municipalities characterized as "heavy non-resident borrowers" tend to

1) have lower equalized tax rates than municipalities not so characterized. Furthermore, libraries in those communities tend to

2) receive less income (per capita) and

3) spend less for the purchase of library materials

than other libraries in the core area.

Reciprocal Borrowing in the Pittsfield Core Area
Total Non-Resident Loans, Periods 1-8

RECEIVED LOANS / MADE LOANS	Adams	Becket	Cheshire	Dalton	Gt.Barrington	Hancock	Hinsdale	Lanesborough	Lee	Lenox	New Ashford	North Adams	Pittsfield	Richmond	Stockbridge	Washington	W.Stockbridge	Williamstown	Total Loans Received
Adams												143	11					59	213
Becket									59	9			135						203
Cheshire	898											15	186						1,099
Dalton										51			467						518
Gt.Barrington									17	280		1	121	8	23				450
Hancock												4	118					34	156
Hinsdale													194						194
Lanesborough										1			312					18	331
Lee					1					221			170		61				453
Lenox									62			1	445		13				521
New Ashford													4					45	49
North Adams	26									10			25					126	187
Pittsfield							9		10	466									485
Richmond										77			367				63		507
Stockbridge					23				27	695			134						879
Washington							8			7			44						59
W.Stockbridge					12					205			73		36				326
Williamstown										2		197	71						270
Total Loans Made	924	0	no returns	no returns	36	no returns	17	no returns	175	2,024	no public library	361	2,877	8	133	no public library	63	282	6,900

CORE AREA ANALYSIS: MUNICIPALITIES RANKED BY NON-RESIDENT BORROWINGS PER CAPITA, HIGHEST TO LOWEST

Core Area: Pittsfield Activity Index= Total Projected Non-Resident Volume in Area / Area Population = .330 Population Density=262.3 per sq. mile

Municipality (pop.)	NR Borrowings per capita	(A) Median School Yr. Completed	(B) Personal Income Per Cap. ($)	(C) Library Income Per Cap. ($)	(D) Materials Exp. Per Cap. ($)	(E) Circ. Per Cap. ($)	(F) True Value Tax Rate per $1,000	(G) Professionals (MLS) per 10,000 pop.
1. Cheshire (3,199)	2.233	12.1	4,399	1.09	.44	2.93	25.93	.00
2. New Ashford (160)	1.991	ND	6,124	.00	.00	.00	6.57	.00
3. Richmond (1,689)	1,951	ND	5,399	2.16	.49	5.37	21.34	.00
4. W. Stockbridge (1,355)	1.564	ND	4,674	1.75	.40	12.61	22.23	.00
5. Hancock (697)	1.455	ND	4,232	ND	ND	ND	14.30	ND
6. Becket (1,153)	1.144	ND	4.050	5.88	1.10	7.80	16.00	.00
7. Washington (486)	.789	ND	3.879	.00	.00	ND	10.49	.00
8. Hinsdale (1,749)	.721	ND	4,320	2.30	.41	16.58	26.22	.00
9. Lanesborough (3,237)	.661	12.4	4,903	1.22	.40	2.62	31.50	.00
10. Lenox (5,718)	.592	12.5	4,965	ND	ND	ND	31.08	ND
11. Lee (6,319)	.466	12.3	4,373	8.47	1.67	7.87	35.55	ND
12. Dalton (7,504)	.449	12.4	4,795	ND	ND	ND	32.50	ND
13. Gt. Barrington (7,068)	.414	12.1	4,443	6.28	.75	5.00	32.86	.00
14. Stockbridge (2,228)	.395	ND	5,442	NR	NR	NR	24.08	NR
15. Williamstown (8,247)	.213	12.6	4,563	6.36	1.32	10.03	38.07	.00

Municipality (pop.)	NR Borrowings per capita	A	B	C	D	E	F	G
16. Adams (11,270)	.123	10.2	4,364	6.12	1.02	7.81	35.40	.00
17. North Adams (18,424)	.066	10.7	3,771	5.80	1.06	5.80	55.85	.54
18. Pittsfield (55,299)	.057	12.2	4,759	8.05	1.24	10.34	46.40	1.27
Mean	.849	12.0	4,636	3.96	.74	7.29	28.13	NSD
Standard Deviation	.703	.815	585.96	3.01	.508	4.45	12.35	NSD
Coefficient of Variation	.828	.068	.126	.761	.686	.610	.439	NSD

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CORE AREA: Pittsfield

Coefficients of Correlation (Product-Moment) Among Socioeconomic, Library Support, and Library Activity Indicators

A= Median School Year Completed
B= Personal Income Per Capita
C= Total Library Income Per Capita
D= Library Materials Expenditure Per Capita
E= Total Circulation Per Capita
F= True-Value Tax Rate per $1,000
G= Graduate Professionals (MLS) per 10,000 pop.

note: relationships are linear (y=a+bx) unless otherwise noted

	A	B	C	D	E	F	G
A		NSD	NSD	NSD	NSD	NSD	NSD
B	NSD		-.355	-.362	-.436	-.312	NSD
C	NSD	-.355		.953	.298	.698	NSD
D	NSD	-.362	.953		.286	.691	NSD
E	NSD	-.436	.298	.286		.215	NSD
F	NSD	-.312	.698	.691	.215		NSD
G	NSD	NSD	NSD	NSD	NSD	NSD	NSD

Underlined coefficients significant at .05 level

Coefficients of Correlation (Point-Biserial unless otherwise noted) Between Non-Resident Borrowings Per Capita, and Socioeconomic, Library Support and Library Activity Indicators

	Non-Resident Borrowings Per Capita
Median School Year Completed	NSD
Personal Income Per Capita	.255
Total Library Income Per Capita	-.704*
Materials Expenditure Per Capita	-.615*
Circulation Per Capita	-.091
True Value Tax Rate Per $1,000	-.705*
Professionals (MLS) per 10,000 pop.	NSD

*linear relationship (y=a+bx)

Underlined coefficients significant at .05 level

DESCRIPTIVE ANALYSIS : QUINCY CORE AREA

Number of Municipalities in Core Area: 15

Non-Resident Borrowing Activity Index: Low (.122), ranking 15th of the 16 core areas.

Educational Level: Relatively high and very homogeneous, ranging from 12.1 Median School Years Completed for Boston to 13.1 for Cohasset.

Total Library Income: High, but relatively homogeneous in comparison with other core areas, even though per-capita total library income figures range from $4.40 for Rockland to $17.52 for Hingham.

Library Materials expenditure: Relatively homogeneous, with values ranging from $.76 for Rockland to $2.73 for Cohasset.

True Value Tax Rate: High tax rate area, with 5 municipalities having equalized tax rates in excess of the statewide figure of $47.02 per thousand, and none having a rate of less than $35.55 per thousand.

Professional Library Staffing: Professional staffing at a high level, with only 1 municipality reporting no graduate professional staff during the survey period.

The Lenders and the Borrowers (refer to page 112)

Three municipalities account for 81% of the area's non-resident loans: Boston (34%), Hingham (29%) and Quincy (18%).

The above percentages represent 12% of Boston's total non-resident loans, 93% of Hingham's and 94% of Quincy's. It must also be pointed out that Hingham chose to terminate participation in the free non-resident borrowing program midway in the sample year and establish fees for non-resident use. Subsequent to this action, Hingham's non-resident loan volume dropped by approximately 74%: from a daily average of 174 non-resident loans to a daily average of 46.

Four municipalities (Braintree, Cohasset, Quincy, Weymouth) account for 52% of area non-resident borrowings. The largest single block of non-resident loans (a projected 13,774) was made to residents of Quincy by th

Boston Public Library, with the second largest block (12,493) made to Cohasset residents by the Hingham Public Library.

General Area Relationships (refer to page 114)

Correlation analysis among socioeconomic, library support and library activity indicators confirms a number of anticipated significant relationships, such as:

1) Highly significant positive relationships between socioeconomic status indicators (educational level and personal income) and library circulation (A-E, B-E).

2) Significant negative relationships between socioeconomic status indicators and local tax rates (A-F, B-F).

Non-Resident Borrowing Relationships (refer to page 114)

Correlation analysis between (a) non-resident borrowings per capita, and (b) various indicators of socio-economic status, library support and library activity produces 3 significant relationships. Based on these relationships, it may be said that:

In the Quincy Core Area, municipalities characterized as "heavy non-resident borrowers" tend to

1) have significantly lower equalized tax rates than municipalities not so characterized, and that residents of those communities tend to

2) have higher educational levels, and

3) higher per capita personal incomes

than in other municipalities in the core area.

Reciprocal Borrowing in the Quincy Core Area
Total Non-Resident Loans, Periods 1-8

LOANS MADE

LOANS RECEIVED	Boston	Braintree	Canton	Cohasset	Hanover	Holbrook	Hull	Hingham	Milton	Norwell	Quincy	Randolph	Rockland	Scituate	Weymouth	Total Loans Received
Boston				5		2	84	5	364		231	17			22	730
Braintree	580					40		21	9		1,153	16			1,104	2,923
Canton	197					2	22		43		110	18				392
Cohasset	174							1,922			79			30	16	2,221
Hanover	80			1				311		52	167	10	113		41	775
Holbrook	86										69	281			8	444
Hull	162							754	5		179				4	1,104
Hingham	233			18							137		19	4	75	486
Milton	1,299		2				18	18			250	6			4	1,597
Norwell	94				86			536	4		27		97	37	1	882
Quincy	2,119							167	196			11	2		146	2,641
Randolph	517		12			47	11	5	156		194				6	948
Rockland	46				33			61	3	2	11				21	177
Scituate	239			185				930		18	76	1			4	1,453
Weymouth	644			2		12	4	619	3	2	700	25				2,011
Total Loans Made	6,470	no returns	14	211	119	103	139	5,349	783	74	3,383	385	231	71	1,452	18,784

CORE AREA ANALYSIS: MUNICIPALITIES RANKED BY NON-RESIDENT BORROWINGS PER CAPITA, HIGHEST TO LOWEST

Core Area: Quincy

Activity Index= $\frac{\text{Total Projected Non-Resident Volume in Area}}{\text{Area Population}}$ = .122

Population Density= 4215.0 per square mile

Municipality (pop.)	NR Borrowings per capita	(A) Median School Yr. Completed	(B) Personal Income Per Cap. ($)	(C) Library Income Per Cap. ($)	(D) Materials Exp. Per Cap. ($)	(E) Circ. Per Cap. ($)	(F) True Value Tax Rate per $1,000	(G) Professionals (MLS) per 10,000 pop.
1. Cohasset (7,785)	1:854	13.1	6,931	12.97	2.73	13.29	35.55	3.85
2. Hull (10,572)	.679	12.4	4,348	6.90	1.60	5.42	59.40	.95
3. Norwell (8,999)	.637	12.8	5,703	9.48	2.63	9.08	45.43	2.22
4. Scituate (17,829)	.530	12.9	5,151	9.08	1.52	9.40	43.05	1.12
5. Braintree (36,822)	.516	12.5	5,189	9.64	1.58	8.73	38.40	1.90
6. Hanover (10,533)	.478	12.7	4,723	5.60	.99	9.30	45.93	0
7. Milton (27,214)	.381	12.7	6,605	11.56	2.08	9.13	40.48	2.57
8. Holbrook (11,849)	.244	12.3	4,396	7.39	1.34	4.78	46.75	1.69
9. Weymouth (56,854)	.230	12.4	4,869	8.26	1.13	6.12	49.13	.70
10. Randolph (29,206)	.211	12.5	4,830	5.18	.77	5.35	46.54	1.03
11. Quincy (91,487)	.188	12.3	5,057	10.83	1.29	6.39	61.13	1.53
12. Hingham (19,544)	.162	12.9	5,990	17.52	2.25	19.18	38.43	2.05
13. Canton (18,114)	.141	12.6	5,413	12.89	2.41	9.24	37.79	2.21
14. Rockland (17,028)	.068	12.2	3,865	4.40	.76	8.40	52.25	.59
15. Boston (637,986)	.007	12.1	4,157	15.07	2.14	3.75	123.92	1.65
Mean	.422	12.6	5,148	9.79	1.68	8.50	50.95	1.60
Standard Deviation	.447	.287	870	3.75	.654	3.83	21.54	.942
Coefficient of Variation	1.060	.023	.169	.383	.390	.451	.423	.589

CORE AREA: Quincy

Coefficients of Correlation (Product-Moment) Among Socioeconomic, Library Support, and Library Activity Indicators

A= Median School Year Completed
B= Personal Income Per Capita
C= Total Library Income Per Capita
D= Library Materials Expenditure Per Capita
E= Total Circulation Per Capita
F= True Value Tax Rate per $1,000
G= Graduate Professionals (MLS) per 10,000 pop.

note: relationships are linear (y=a+bx) unless otherwise noted

	A	B	C	D	E	F	G
A		.670	.310	.529	.775	-.634	.498
B	.670		.543	.686	.655	-.628*	.796
C	.310	.543		.772	.528	.197	.653
D	.529	.686	.772		.460	-.011	.835
E	.775	.655	.528	.460		-.520	.415
F	-.634	-.628*	.197	-.011	-.520		-.190
G	.498	.796	.653	.835	.415	-.190	

Underlined coefficients significant at .05 level

* Curvilinear power relationship ($y=ax^b$)

Coefficients of Correlation (Point-Biserial unless otherwise noted) Between Non-Resident Borrowings Per Capita, and Socioeconomic, Library Support and Library Activity Indicators

	Non-Resident Borrowings Per Capita
Median School Year Completed	.659*
Personal Income Per Capita	.594*
Total Library Income Per Capita	.005
Materials Expenditure Per Capita	.145
Circulation Per Capita	.257
True Value Tax Rate Per $1,000	-.700
Professionals (MLS) per 10,000 pop.	.209

*Linear relationship (y=a+bx)

Underlined coefficients significant at .05 level

DESCRIPTIVE ANALYSIS : SPRINGFIELD CORE AREA

Number of Municipalities in Core Area: 17

Non-Resident Borrowing Activity Index: .242

Educational Level: Generally low, with 6 of the 17 municipalities having a Median School Year Completed figure of less than 12.0 years. Range is from 10.6 for Ware to 13.8 for Longmeadow.

Personal Income Level: Low and relatively homogeneous, with 12 of 17 municipalities having a per capita personal income figure below the statewide figure of $4,755.

Total Library Income: Low but relatively heterogeneous, with per capita total library income values ranging from $2.74 for Southwick to $12.37 for Springfield.

Library Materials Expenditure: Low but heterogeneous, with per capita materials expenditure figures ranging from $.54 for Southwick to $2.28 for Wilbraham.

True Value Tax Rate: Relatively high tax rate area, with the 3 municipalities with equalized tax rates in excess of the statewide figure of $47.02 per thousand containing 57% of area population.

Professional Library Staffing: Rather limited local access to professionalism, with only 4 of the 17 municipalities reporting more than 1 graduate professional per 10,000 population.

The Lenders and the Borrowers (refer to page 117)

Springfield accounts for a projected 63,603 loans; 55% of the area non-resident loans. Loans to municipalities within this core area represent 93% of Springfield's total non-resident loans.

East Longmeadow and South Hadley also have substantial non-resident loan volumes.

Longmeadow is the major borrowing community, with a non-resident borrowing volume projected at 14,911 borrowings annually.

General Area Relationships (refer to page 120)

Correlation analysis among socioeconomic, library support and library activity indicators confirms

several anticipated significant relationships, such as:

1) Significant positive relationships between library income and library materials expenditures (C and D) and library circulation (E).

2) Significant positive relationships between socioeconomic status indicators (educational level and personal income) and library circulation (A-E, B-E).

Non-Resident Borrowing Relationships (refer to page 120)

Correlation analysis between (a) non-resident borrowings per capita, and (b) various socioeconomic, library support and library activity indicators produces 2 significant relationships. Based on these relationships, it may be said that:

In the Springfield Core Area, municipalities characterized as "heavy non-resident borrowers" tend to

1) *have significantly lower equalized tax rates than municipalities not so characterized; and that residents of those communities tend to*

2) *have significantly higher personal incomes than in other municipalities in the core area.*

Reciprocal Borrowing in the Springfield Core Area
Total Non-Resident Loans, Periods 1-8

LOANS RECEIVED — LOANS MADE

	Agawam	Chicopee	E.Longmeadow	Granby	Hampden	Holyoke	Longmeadow	Ludlow	Monson	Palmer	South Hadley	Southwick	Springfield	Ware	Westfield	W.Springfield	Wilbraham	Total Loans Received
Agawam		6	2								1		1,127		149	695	3	1,983
Chicopee			9					30			423		1,410		2	32	2	1,908
E.Longmeadow													571			26	1	598
Granby		35						54			286		79			7		461
Hampden		2	354				1	7					492				153	1,009
Holyoke		59								1	1,052		479		12	46		1,649
Longmeadow			712										1,561		4	17		2,294
Ludlow		9		1						1			853		2		61	927
Monson			7							362			149	4			36	558
Palmer								8	194				181	9	8		56	456
South Hadley		130		36									64		1			231
Southwick													125		426	7		558
Springfield		249	975				108	253		7	16				23	154	48	1,833
Ware										21	30		130					181
Westfield		1	4										419			20		444
W.Springfield		31	34				29	14			21		976		240			1,345
Wilbraham		20	122					154	2	30			1,169	12	3	4		1,516
Total Loans Made	no returns	542	2,219	37	no returns	no returns	138	520	196	422	1,829	no returns	9,785	25	870	1,008	360	17,951

CORE AREA ANALYSIS: MUNICIPALITIES RANKED BY NON-RESIDENT BORROWINGS PER CAPITA, HIGHEST TO LOWEST

Core Area: Springfield

Activity Index= $\frac{\text{Total Projected Non-Resident Volume in Area}}{\text{Area Population}}$ = .242

Population Density= 1091.6 per sq. mile

Municipality (pop.)	NR Borrowings per capita	(A) Median School Yr. Completed	(B) Personal Income Per Cap. ($)	(C) Library Income Per Cap. ($)	(D) Materials Exp. Per Cap. ($)	(E) Circ. Per Cap. ($)	(F) True Value Tax Rate per $1,000	(G) Professionals (MLS) per 10,000 pop.
1. Hampden (4,751)	1.381	12.4	4,635	3.50	1.00	5.19	33.50	0
2. Longmeadow (16,676)	.894	13.8	7,944	9.29	1.48	12.48	42.12	.60
3. Wilbraham (13,139)	.750	12.7	5,611	10.32	2.28	9.45	29.00	1.52
4. Granby (5,609)	.534	12.3	4,297	4.27	.92	5.82	38.72	0
5. Aquawam (24,305)	.530	12.3	4,768	6.20	1.26	5.38	31.68	0
6. Southwick (7,028)	.516	12.2	4,200	2.74	.54	5.52	38.40	0
7. Monson (7,376)	.492	11.1	3,680	6.20	1.48	4.61	34.74	0
8. Ludlow (18,183)	.332	11.8	4,326	4.10	.75	3.40	38.69	.55
9. W. Springfield (28,249)	.309	12.3	5,035	6.87	1.16	5.67	35.70	1.06
10. E. Longmeadow (13,132)	.296	12.5	4,979	9.26	1.67	11.47	37.60	.76
11. Palmer (11,755)	.252	11.8	4,427	6.56	1.28	8.92	34.74	.85
12. Holyoke (46,790)	.229	11.6	4.096	4.75	.65	2.63	81.34	.21
13. Chicopee (58,431)	.213	11.2	4,252	5.54	.82	4.25	59.94	.17
14. Ware (8,679)	.136	10.6	3,922	5.40	1.00	6.33	35.28	0
15. S. Hadley (16,568)	.090	12.2	4,329	8.11	1.60	7.99	34.78	1.81
16. Westfield (32,863)	.088	12.2	4,487	10.12	1.39	10.74	39.69	.61

Municipality (pop.)	NR Borrowings per capita	A	B	C	D	E	F	G
17. Springfield (168,785)	.071	12.0	4,145	12.37	1.46	5.80	66.30	1.07
Mean.	.418	12.1	4,655	6.80	1.22	6.80	41.90	.54
Standard Deviation	.341	.712	963	2.72	.437	2.88	13.94	.57
Coefficient of Variation	.816	.059	.207	.400	.358	.424	.333	1.06

CORE AREA: Springfield

Coefficients of Correlation (Product-Moment) Among Socioeconomic, Library Support, and Library Activity Indicators

A= Median School Year Completed
B= Personal Income Per Capita
C= Total Library Income Per Capita
D= Library Materials Expenditure Per Capita
E= Total Circulation Per Capita
F= True Value Tax Rate per $1,000
G= Graduate Professionals (MLS) per 10,000 pop.

note: relationships are linear (y=a+bx) unless otherwise noted

	A	B	C	D	E	F	G
A		.862*	.354	.387	.612	-.220	.349
B	.862*		.236	.287	.655	-.178	.257
C	.354	.236		.799	.641	.066	.674
D	.387	.287	.799		.669	-.376	.672
E	.612	.655	.641	.669		-.4[illegible]	.449
F	-.220	-.178	.066	-.376	-.499*		-.109
G	.349	.257	.674	.672	.449	-.109	

Underlined coefficients significant at .05 level

*curvilinear exponential relationship ($y=ae^{bx}$)

Coefficients of Correlation (Point-Biserial unless otherwise noted) Between Non-Resident Borrowings Per Capita, and Socioeconomic, Library Support and Library Activity Indicators

	Non-Resident Borrowings Per Capita
Median School Year Completed	.503*
Personal Income Per Capita	.356
Total Library Income Per Capita	-.275
Materials Expenditure Per Capita	.124
Circulation Per Capita	.185
True Value Tax Rate Per $1,000	-.636
Professionals (MLS) per 10,000 pop.	-.021

*linear relationship (y=a+bx)

Underlined coefficients significant at .05 level

DESCRIPTIVE ANALYSIS : TAUNTON CORE AREA

Number of Municipalities in Core Area: 15

Non-Resident Borrowing Activity Index: .378 (4th highest of 16 core areas).

Educational Level: Low and relatively homogeneous, ranging from 10.7 for Taunton to 12.5 for Easton and Foxborough.

Personal Income Level: A relatively low income area, with only 2 municipalities (Raynham and Seekonk) having a per capita personal income figure above the statewide figure of $4,755.

Total Library Income: Very low and relatively homogeneous, with the Foxborough figure of $9.08 and the Rehobeth figure of $.78 representing extremes.

Library Materials Expenditure: Low and relatively homogeneous ranging from $.21 for Rehobeth to $1.88 for Foxborough.

True Value Tax Rate: Relatively low tax area, with all communities below the statewide equalized tax rate figure of $47.02.

Professional Library Staffing: Limited local access to professionalism.

The Lenders and the Borrowers (refer to page 123)

The largest non-resident lender, Taunton, accounts for a projected 43,979 non-resident loans, 62% of the area total. This figure represents 91% of Taunton's total non-resident loans.

Attleboro and Foxborough also show reasonably substantial non-resident loan totals.

The heaviest borrowing community is Dighton, and the largest single block of non-resident loans (10,837 projected) are made by the Taunton library to residents of Dighton.

General Area Relationships (refer to page 125)

Correlation analysis among socioeconomic, library support and library activity indicators confirms several significant relationships, such as:

1) Significant positive relationships between library income and library materials expenditure (C and D) and library circulation (E).

2) Highly significant positive relationships between local tax rates (F) and library income and expenditure (C and D). This is 1 of only 2 core areas in which local tax effort is positively related to the amounts of money that local libraries receive and spend.

Non-Resident Borrowing Relationships (refer to page 125)

Correlation analysis between (a) non-resident borrowings per capita, and (b) various socioeconomic, library support and library activity indicators produces 4 significant relationships. Based on these relationships, it may be said that:

In the Taunton Core Area, municipalities characterized as "heavy non-resident borrowing" communities tend to:

1) have lower equalized tax rates,

2) spend significantly less for library services in general, and

3) spend significantly less for library materials that municipalities not characterized as heavy non-resident borrowers.

also,

3) libraries in these municipalities tend to have slightly lower circulation rates than libraries in other municipalities in the core area.

Reciprocal Borrowing in the Taunton Core Area
Total Non-Resident Loans, Periods 1-8

RECEIVED LOANS	LOANS MADE															
	Attleboro	Berkley	Dighton	Easton	Foxborough	Freetown	Lakeville	Mansfield	Middleborough	N. Attleboro	Norton	Raynham	Rehoboth	Seekonk	Taunton	Total Loans Received
Attleboro					34			24		96	23		8	220	245	650
Berkley			129												805	934
Dighton	1	11											10		1,667	1,689
Easton	1				62										126	189
Foxborough	25							82		3					281	391
Freetown			17												303	320
Lakeville									282						206	488
Mansfield	68				844						46				314	1,272
Middleborough															219	219
N. Attleboro	905				48			19							149	1,121
Norton	206				40			76							738	1,060
Raynham					5			3			2				1,277	1,287
Rehoboth	493		5		2						8			192	323	1,023
Seekonk	84												10		113	207
Taunton	17		8		13						22	27				87
Total Loans Made	1,800	11	159	0	1,048	0	0	204	282	99	101	27	28	412	6,766	10,937

CORE AREA ANALYSIS: MUNICIPALITIES RANKED BY NON-RESIDENT BORROWINGS PER CAPITA, HIGHEST TO LOWEST

Core Area: Taunton

Activity Index= $\frac{\text{Total Projected Non-Resident Volume in Area}}{\text{Area Population}}$ = .378

Population Density=450.9 per sq. mile

Municipality (pop.)	NR Borrowings per capita	(A) Median School Yr. Completed	(B) Personal Income Per Cap. ($)	(C) Library Income Per Cap. ($)	(D) Materials Exp. Per Cap. ($)	(E) Circ. Per Cap. ($)	(F) True Value Tax Rate per $1,000	(G) Professionals (MLS) per 10,000 pop.
1. Berkley (2,300)	2.640	NA	4,110	3.23	.64	5.42	28.52	.00
2. Dighton (5,076)	2.163	12.1	4,593	1.79	.42	3.94	26.80	.00
3. Raynham (7,720)	1.084	12.3	4,827	3.09	.52	4.50	37.20	.00
4. Rehoboth (7,009)	.949	12.1	4,504	.78	.21	2.03	30.50	.00
5. Norton (9,869)	.698	12.1	3,891	5.60	1.17	4.77	42.16	1.01
6. Mansfield (12,447)	.664	12.3	4,559	5.48	1.15	4.77	34.04	1.61
7. Lakeville (5,118)	.620	12.0	4,520	3.16	.63	2.17	32.21	.00
8. Freetown (5,417)	.386	11.3	4,306	2.31*	.74*	2.67*	25.95	.00
9. N. Attleboro (19,120)	.381	12.1	4,573	4.91	.91	4.30	32.75	.52
10. Foxborough (14,690)	.173	12.5	4,636	9.08	1.88	8.03	36.36	.68
11. Attleboro (32,650)	.129	11.9	4,664	7.37	1.80	5.67	43.07	.61
12. Seekonk (11,351)	.119	12.1	4,973	3.62	.59	4.61	30.60	.88
13. Middleborough (14,146)	.101	12.0	4,024	6.67	1.39	5.00	42.24	.00
14. Easton (13,138)	.094	12.5	4,733	4.81	.96	4.94	38.20	.76
15. Taunton (42,148)	.013	10.7	3,857	5.13	.98	10.81	42.26	.24
Mean	.681	12.0	4,551	4.47	.93	4.91	34.87	.45
Standard Deviation	.777	.474	339.5	2.22	.482	2.20	5.89	.503
Coefficient of Variation	1.141	.040	.075	.496	.518	.448	.169	1.118

*FY 1978 data

CORE AREA: Taunton

Coefficients of Correlation (Product-Moment) Among Socioeconomic, Library Support, and Library Activity Indicators

A= Median School Year Completed
B= Personal Income Per Capita
C= Total Library Income Per Capita
D= Library Materials Expenditure Per Capita
E= Total Circulation Per Capita
F= True Value Tax Rate per $1,000
G= Graduate Professionals (MLS) per 10,000 pop.

note: relationships are linear (y=a+bx) unless otherwise noted

	A	B	C	D	E	F	G
A		.604	.163	.092	-.374	-.069	.346
B	.604		.416	.134	-.329	-.303	.193
C	.163	.416		.928	.614	.703	.490
D	.092	.134	.928		.528	.659	.441
E	-.374	-.329	.614	.528		.555	.201
F	-.069	-.303	.703	.659	.555		.275
G	.346	.193	.490	.441	.201	.275	

Underlined coefficients significant at .05 level

Coefficients of Correlation (Point-Biserial unless otherwise noted) Between Non-Resident Borrowings Per Capita, and Socioeconomic, Library Support and Library Activity Indicators

	Non-Resident Borrowings Per Capita
Median School Year Completed	.001
Personal Income Per Capita	-.122
Total Library Income Per Capita	-.528*
Materials Expenditure Per Capita	-.589
Circulation Per Capita	-.565
True Value Tax Rate Per $1,000	-.550*
Professionals (MLS) per 10,000 pop.	-.195

*linear relationship (y=ax+b)

Underlined coefficients significant at .05 level

DESCRIPTIVE ANALYSIS : WELLESLEY CORE AREA

Number of Municipalities in Core Area: 14

Non-Resident Borrowing Activity Index: Average (.245)

Educational Level: The highest of all core areas: 13.7 Median School Years Completed (this represents the average of all municipalities). Relatively heterogeneous with respect to this characteristic, however, with values ranging from 12.6 years for Natick to 15.2 years for Weston and Wellesley.

Personal Income Level: Highest of all core areas. Heterogeneous with respect to this charactistic, with with values ranging from $5,237 per capita personal income for Holliston to $9,982 for Dover.

Total Library Income: High, with 88% of the area population in municipalities appropriating in excess of $10.00 per capita for library services.

Library Materials Expenditure: High but relatively heterogeneous, with per capita materials expenditures ranging from $.98 for Medfield to $3.99 for Wellesley.

True Value Rax Rate: Relatively low tax area, with only 1 municipality (Newton) above the statewide equalized rate of $47.02 per thousand. It should be noted , however, that Newton contains 25% of total area population.

Professional Library Staffing: Substantial local access to professionalism, with only 1 municipality having no graduate professionals on staff during the survey period.

The Lenders and the Borrowers (refer to page 128)

Wellesley accounted for 59% of all area non-resident loans: a projected 51,214 loans for the sample year. This represents 83% of Wellesley's total non-resident loans.

Natick was the heaviest non-resident borrowing community in terms of total volume: a projected 15,483 borrowings for the sample year. The 2 largest blocks of non-resident loans were made by the Wellesley library to residents of Natick (projected 12,084) and by the Wellesley library to residents of Weston (projected 11,700).

General Area Relationships (refer to page 130)

Correlation analysis among socioeconomic, library support and library activity indicators confirms a number of anticipated significant relationships, such as:

1) A significant positive relationship between educational level and library circulation (A-E).

2) Significant positive relationships between per capita library income and per capita materials expenditures (C and D) and library circulation (E).

Non-Resident Borrowing Relationships (refer to page 130)

The initial correlation analysis between (a) non-resident borrowings per capita, and (b) various socioeconomic, library support and library activity indicators produced a significant positive relationship between non-resident borrowings per capita and per capita personal income, and a significant negative relationship between non-resident borrowings and staff professionalization.

However, scatter plot analysis reveals that the .401 coefficient (not significant) between non-resident borrowings and educational level is probably misleading, skewed by Wellesley's very low non-resident borrowing rate--an understandable situation in view of Wellesley's status as a subregional center. Data excluding Wellesley yields a significant coefficient of .622 (exponential).

Based on these relationships, it may be said that:

In the Wellesley Core Area, residents of municipalities characterized as "heavy non-resident borrowing" communities tend to

1) have higher educational levels, and

2) higher personal income levels than residents of municipalities not so characterized.

Libraries in these municipalities tend to

3) employ fewer graduate professionals (per 10,000 population) than other libraries in the core area (note: this relationship is modest but statistically significant).

Reciprocal Borrowing in the Wellesley Core Area
Total Non-Resident Loans, Periods 1-8

LOANS RECEIVED — LOANS MADE

	Dedham	Dover	Framingham	Holliston	Medfield	Natick	Needham	Newton	Sherborn	Sudbury	Wayland	Wellesley	Weston	Westwood	Total Loans Received
Dedham		3	4		2		82					40		181	312
Dover	6		1		9	25	238	5	21			606		510	1,421
Framingham		3				38	16	16	1	47	35	363	7	1	527
Holliston			248			4			54			114			420
Medfield	7	48	8			1	99	10	12		4	295		444	928
Natick		3	351				80	14	6		61	1,859	8		2,382
Needham	30	44	1		19	3		20				1,201		7	1,325
Newton	16	6	2			1	378					990	16	14	1,422
Sherborn		6	17	43	2	18						211			297
Sudbury			388			5		9			311	38	8		759
Wayland			87	7		9	5	28		1		221	208		566
Wellesley	4	4	15			31	441	69	2	1	15		27	9	618
Weston			2				93	103			61	1,800			2,059
Westwood	96		16				93	4				141			350
Total Loans Made	159	116	1,140	50	32	135	1,525	278	96	49	487	7,879	274	1,166	13,386

CORE AREA ANALYSIS: MUNICIPALITIES RANKED BY NON-RESIDENT BORROWINGS PER CAPITA, HIGHEST TO LOWEST

Core Area: Wellesley Activity Index= Total Projected Non-Resident Volume in Area / Area Population = .245 Population Density= 1590.8 per sq. mile

Municipality (pop.)	NR Borrowings per capita	(A) Median School Yr. Completed	(B) Personal Income Per Cap. ($)	(C) Library Income Per Cap. ($)	(D) Materials Exp. Per Cap. ($)	(E) Circ. Per Cap. ($)	(F) True Value Tax Rate per $1,000	(G) Professionals (MLS) per 10,000 pop.
1. Dover (4,923)	1.876	14.7	9,982	8.45	1.02	6.72	24.90	0
2. Weston (11,478)	1.166	15.2	9,609	11.20	1.61	13.44	33.60	2.61
3. Medfield (10,031)	.601	12.8	5,864	4.65	.98	6.74	40.23	1.00
4. Natick (31,102)	.498	12.6	5,459	10.50	1.44	8.20	41.85	2.57
5. Sherborn (4,116)	.469	14.5	6,742	15.45	3.24	12.21	34.00	2.48
6. Sudbury (14,951)	.330	14.6	6,342	9.53	1.68	12.19	36.48	3.34
7. Needham (29,936)	.288	13.4	7,010	12.47	2.15	12.12	34.58	1.34
8. Wayland (13,282)	.277	14.2	6,926	11.75	2.55	13.30	46.31	3.76
9. Hollisten (12,921)	.211	12.8	5,237	5.83	1.58	7.24	36.00	1.55
10. Westwood (14,019)	.163	13.2	7,040	14.94	2.66	12.19	38.86	2.85
11. Wellesley (26,593)	.151	15.2	7,858	17.65	3.99	14.23	37.41	5.27
12. Newton (89,183)	.103	12.9	7,129	10.63	1.30	6.89	53.18	1.80
13. Dedham (26,924)	.075	12.4	5,312	11.76	2.30	6.61	36.68	2.23
14. Framingham (65,564)	.052	12.7	5,516	10.71	1.72	9.03	37.82	2.29
Mean	.447	13.7	6,859	11.11	2.02	10.08	37.99	2.36
Standard Deviation	.503	1.03	1,481	3.50	.862	2.96	6.49	1.28
Coefficient of Variation	1.125	.075	.216	.315	.427	.294	.171	.542

CORE AREA: Wellesley

Coefficients of Correlation (Product-Moment) Among Socioeconomic, Library Support, and Library Activity Indicators

A= Median School Year Completed
B= Personal Income Per Capita
C= Total Library Income Per Capita
D= Library Materials Expenditure Per Capita
E= Total Circulation Per Capita
F= True Value Tax Rate per $1,000
G= Graduate Professionals (MLS) per 10,000 pop.

note: relationships are linear (y=a+bx) unless otherwise noted

	A	B	C	D	E	F	G
A		.766	.397	.382	.689	-.406	.381
B	.766		.223	.016	.332	-.401	-.071
C	.397	.223		.877	.689	.018	.666
D	.382	.016	.877		.688	.014	.748
E	.689	.332	.689	.688		-.064	.718
F	-.406	-.401	.018	.014	-.064		.306
G	.381	-.071	.666	.748	.718	.306	

Underlined coefficients significant at .05 level

Coefficients of Correlation (Point-Biserial unless otherwise noted) Between Non-Resident Borrowings Per Capita, and Socioeconomic, Library Support and Library Activity Indicators

	Non-Resident Borrowings Per Capita
Median School Year Completed	.401*
Personal Income Per Capita	.752
Total Library Income Per Capita	-.209
Materials Expenditure Per Capita	-.256
Circulation Per Capita	.217
True Value Tax Rate Per $1,000	-.277
Professionals (MLS) per 10,000 pop.	-.553**

*See "Descriptive Analysis" preceding

Underlined coefficients significant at .05 level

** Continuous curvilinear relationship ($y=ax^b$)

DESCRIPTIVE ANALYSIS : WORCESTER CORE AREA

Number of Municipalities in Core Area : 24

Non-Resident Borrowing Activity Index: .406 (2nd highest ~~of the~~ 16 core areas)

Educational Level: Relatively low, with Median School Years Completed figures ranging from 10.2 for Webster to 12.7 for Paxton and Holden.

Personal Income Level: Average and relatively homogeneous with respect to this characteristic, with per capita personal income figures ranging from $3,904 for Charlton to $5,607 for Holden.

Total Library Income: Relatively low, with only 2 communities having per capita library income figures in excess of $10.00.

Library Materials Expenditure: Low but relatively heterogeneous, with per capita figures ranging from $.38 for Clinton to $2.46 for Northborough.

True Value Tax Rate: Although only 3 municipalities (Worcester, Clinton and Millbury) had equalized tax rates in excess of the statewide average of$47.02 per thousand, these municipalities contain 49% of area population.

Professional Library Staffing: Limited local access to professional staff, with only 9 libraries reporting graduate professionals during the period of the survey.

The Lenders and the Borrowers (refer to page 133)

The area's major lender, Worcester, accounted for 74% of total area activity: a projected 120,677 non-resident loans. This represents approximately 83% of Worcester's total non-resident loans.

The largest blocks of non-resident loans were made by the Worcester library to residents of Shrewsbury (17,466 projected) and by the Worcester library to residents of Holden (15,321 projected)/

General Area Relationships (refer to page 137)

Correlation analysis among socioeconomic, library support, and library activity indicators confirms

several significant relationships, such as:

1) A significant positive relationship between personal income level and library circulation (B-E).

2) A significant negative relationship between personal income and the equalized tax rate (B-F).

3) Significant positive relationships between per capita library income and per capita materials expenditures (C and D) and library circulation (E).

Non-Resident Borrowing Relationships (refer to page 137)

The initial correlation analysis between (a) non-resident borrowings per capita, and (b) various socio-economic, library support and library activity indicators produced significant positive relationships between non-resident borrowings per capita and personal income per capita and between non-resident borrowings and local circulation per capita, and a significant negative relationship between non-resident borrowings and local equalized tax rates.

However, scatter plot analysis reveals that the .292 coefficient of correlation between "non-resident borrowings per capita" and "median school years completed" is probably misleading, skewed by Worcester's extremely low non-resident borrowing volume--an understandable situation in view of Worcester's status as a regional center. Data excluding Worcester yields a modest but significant coefficient of .452 .

Based on these relationships, it may be said that:

In the Worcester Core Area, municipalities characterized as "heavy non-resident borrowers" tend to:

1) have lower equalized tax rates than municipalities not so characterized. Residents of these communities tend to

2) have significantly higher educational levels, and

3) significantly higher personal incomes than in other municipalities in the core area.

Furthermore, libraries in heavy borrowing municipalities tend to

4) have slightly higher local circulation rates than other libraries in the core area.

Reciprocal Borrowing in the Worcester Core Area
Total Non-Resident Loans, Periods 1-8

LOANS MADE

LOANS RECEIVED	Auburn	Boylston	Charlton	Clinton	Douglas	Dudley	Grafton	Holden	Leicester	Millbury	Northborough	Northbridge	Oxford
Auburn										2			7
Boylston								3			33		
Charlton	139												
Clinton		5											
Douglas												91	
Dudley	53												26
Grafton	21							2		3	1	6	
Holden	3												
Leicester	47							3					
Millbury	126											1	1
Northborough													
Northbridge								4		4			
Oxford	250					76		5		1	1		
Paxton	10							78					
Rutland								117					
Shrewsbury	3	26									59		
Southbridge	17					27							
Spencer	11							12		60			
Sturbridge	5									9			
Sutton	56									179		71	
Webster	20					500							7
Westborough	2										55	1	
West Boylston		21						19		42			
Worcester	561	25						189		78	94	5	2
Total Loans Made	1,324	77	no returns	no returns	no returns	603	no returns	432	no returns	378	243	175	43

Reciprocal Borrowing in the Worcester Core Area (continued)
Total Non-Resident Loans, Periods 1-8

LOANS MADE

LOANS RECEIVED

	Paxton	Rutland	Shrewsbury	Southbridge	Spencer	Sturbridge	Sutton	Webster	Westborough	West Boylston	Worcester	Total Loans Received
Auburn			15	11					6		1,920	1,961
Boylston			43							10	510	599
Charlton				283				2			214	647
Clinton											402	407
Douglas											182	273
Dudley				192				593			222	1,086
Grafton			8						40		1,093	1,174
Holden	14		7	2						38	2,293	2,357
Leicester		2	2	13				1			923	991
Millbury		2					108				1,527	1,765
Northborough			118						37		940	1,095
Northbridge				3			3				581	595
Oxford			6	38			23	48			900	1,348
Paxton		6			4						862	960
Rutland	64										291	472
Shrewsbury									2		2,687	2,777
Southbridge						77		19			143	283
Spencer	29	7		19		5					547	690
Sturbridge			2	1,053							254	1,323
Sutton											368	674
Webster				37							284	848
Westborough			17								712	787
West Boylston		1	4								703	790
Worcester	7	3	74	15	2		30		31	15		1,131
Total Loans Made	114	21	296	1,666	6	91	164	663	116	63	18,558	25,033

CORE AREA ANALYSIS: MUNICIPALITIES RANKED BY NON-RESIDENT BORROWINGS PER CAPITA, HIGHEST TO LOWEST

Core Area: Worcester

Activity Index= $\frac{\text{Total Projected Non-Resident Volume in Area}}{\text{Area Population}}$ = .406

Population Density=697.5 per square mile

Municipality (pop.)	NR Borrowings per capita	(A) Median School Yr. Completed	(B) Personal Income Per Cap. ($)	(C) Library Income Per Cap. ($)	(D) Materials Exp. Per Cap. ($)	(E) Circ. Per Cap. ($)	(F) True Value Tax Rate per $1,000	(G) Professionals (MLS) per 10,000 pop.
1. Paxton (3,706)	1.684	12.7	5,226	6.32	1.55	7.87	27.72	0
2. Sturbridge (5,522)	1.557	12.2	5,062	4.76	1.03	7.98	30.82	0
3. Boylston (3,326)	1.171	12.5	5,010	7.82	2.13	7.21	26.70	0
4. Holden (13,629)	1.124	12.7	5,607	8.37	1.39	10.06	28.13	0
5. Millbury (12,121)	.946	11.7	4,258	3.24	.87	3.81	50.58	.83
6. Dudley (7,857)	.898	11.2	4,148	2.78	.65	4.25	36.04	0
7. Sutton (4,969)	.882	12.1	4,456	3.90	1.18	4.10	29.92	0
8. Rutland (3,692)	.831	12.3	4,660	2.53	.58	3.88	36.00	0
9. Southbridge (16,910)	.826	10.6	4,457	7.37	1.53	5.49	38.32	1.18
10. Shrewsbury (21,965)	.822	12.4	5,391	9.43	2.09	7.50	31.42	0
11. W. Boylston (6,284)	.817	12.5	5,569	9.73	1.74	5.75	33.00	0
12. Auburn (15,626)	.816	12.2	4,695	8.95	1.41	7.65	39.40	.64
13. Oxford (10,822)	.810	11.8	3,935	4.92	.84	3.56	36.00	.92
14. Charlton (5,598)	.751	11.6	3,904	ND	ND	ND	28.80	ND
15. Leicester (8,887)	.725	12.0	4,138	4.14	1.05	2.94	40.89	0
16 Grafton (10,630)	.718	12.0	4,425	4.55*	.66*	5.65*	34.80	0*

Municipality (pop.)	NR Borrowings per capita	A	B	C	D	E	F	G
17. Northborough (10,563)	.674	12.6	4,905	11.36	2.46	8.87	36.90	2.84
18. Douglas (3,174)	.565	10.6	4,187	4.95	1.40	6.04	34.71	3.15
19. Spencer (9,895)	.453	11.5	4,152	4.77	.97	4.67	33.28	0
20. Webster (14,444)	.382	10.2	4,190	5.42	.82	6.40	41.40	0
21. Westborough (13,954)	.367	12.5	5,023	7.90	1.42	7.50	31.82	.72
22. Northbridge (12,165)	.318	10.9	4,341	5.48	1.19	5.71	39.82	.82
23. Clinton (13,015)	.203	12.0	4,248	4.58	.38	.84	49.02	0
24. Worcester (172,342)	.043	12.0	4,435	10.68	1.53	4.65	61.64	1.97
Mean	.766	11.9	4,601	6.26	1.26	5.86	36.55	.57
Standard Deviation	.381	.709	508	2.58	.527	2.17	8.10	.93
Coefficient of Variation	.497	.060	.110	.412	.418	.370	.222	1.63

* FY1978 data (FY 1977 data not reported)

CORE AREA: Worcester

Coefficients of Correlation (Product-Moment) Among Socioeconomic, Library Support, and Library Activity Indicators

A= Median School Year Completed
B= Personal Income Per Capita
C= Total Library Income Per Capita
D= Library Materials Expenditure Per Capita
E= Total Circulation Per Capita
F= True Value Tax Rate per $1,000
G= Graduate Professionals (MLS) per 10,000 pop.

note: relationships are linear (y=a+bx) unless otherwise noted

	A	B	C	D	E	F	G
A		.672	.377	.357	.236	-.270	-.245
B	.672		.400	.607	.649	-.451	-.205
C	.377	.400		.830	.520	.027	.359
D	.357	.607	.830		.592	-.277	.391
E	.236	.649	.520	.592		-.527	.104
F	-.270	-.451	.027	-.277	-.527		.330
G	-.245	-.205	.359	.391	.104	.330	

Underlined coefficients significant at .05 level

Coefficients of Correlation (Point-Biserial unless otherwise noted) Between Non-Resident Borrowings Per Capita, and Socioeconomic, Library Support and Library Activity Indicators

	Non-Resident Borrowings Per Capita
Median School Year Completed	.292*
Personal Income Per Capita	.460**
Total Library Income Per Capita	-.114
Materials Expenditure Per Capita	.192
Circulation Per Capita	.439**
True Value Tax Rate Per $1,000	-.724**
Professionals (MLS) per 10,000 pop.	-.044

*See "Descriptive Analysis" preceding

**Linear relationship (y=a+bx)

Underlined coefficients significant at .05 level

Addendum: 1) Fall River - New Bedford Core Area

2) Lowell Core Area

These 2 areas did not project volumes of non-resident loans sufficient to justify complete analysis. Inasmuch as both areas contain subregional contracting libraries, however, matrices of sample volumes have been included (following).

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Reciprocal Borrowing in the Fall River-New Bedford Core Area
Total Non-Resident Loans, Periods 1-8

LOANS MADE

LOANS RECEIVED	Acushnet	Dartmouth	Dighton	Fairhaven	Fall River	Freetown	Mattapoisett	New Bedford	Rochester	Somerset	Swansea	Westport	Total Loans Received
Acushnet				29									29
Dartmouth	7			27						1		31	66
Dighton					3					115			118
Fairhaven	5						7						12
Fall River										246		29	275
Freetown	31		17										48
Mattapoisett		57		278									335
New Bedford		1,622		386	2		12			2			2,024
Rochester	34			4									38
Somerset			3		59								62
Swansea					41					365			406
Westport		44		3	24								71
Total Loans Made	77	1,723	20	727	129	0	19	no returns	0	729	no returns	60	3,484

Reciprocal Borrowing in the Lowell Core Area
Total Non-Resident Loans, Periods 1-8

LOANS MADE

LOANS RECEIVED	Bedford	Billerica	Burlington	Carlisle	Chelmsford	Dracut	Dunstable	Lowell	Tewksbury	Tyngsborough	Westford	Wilmington	Total Loans Received
Bedford			8									2	10
Billerica	127		311	26				55	29			182	730
Burlington	16							3				63	82
Carlisle	70							1					71
Chelmsford	3		3	5				142	5		66	10	234
Dracut								108					108
Dunstable								6		35			41
Lowell	15		10			141			57			12	235
Tewksbury	6							110			13	688	817
Tyngsborough			29					43			9		81
Westford	34		13	1				45					93
Wilmington			2					3	15				20
Total Loans Made	271	no returns	376	32	no returns	141	0	516	106	35	88	957	2,522

CORE AREA ANALYSIS

Summary of Significant Relationships (Positive or Negative) Between Non-Resident Borrowing and Seven Socioeconomic , Library Support and Library Activity Indicators

Core Area	Educational Level	Personal Income Level	Library Income	Library Materials Expenditure	Library Circulation	Local Tax Rate	Library Professionalization
Andover						-	
Boston		+					
Brockton							
Concord-Lexington						-	
Falmouth			-	-	-		
Fitchburg	+					-	
Greenfield						-	
Lynnfield-Salem			-			-	
Marlborough							
Northampton						-	
Pittsfield			-	-			
Quincy	+	+				-	
Springfield	+					-	
Taunton			-	-	-	-	
Wellesley	+	+					
Worcester	+	+			+	-	
Totals	5(+)	4(+)	4(-)	3(-)	1(+) 2(-)	11(-)	1(-)

SUMMARY : CHARACTERISTICS OF "HEAVY BORROWING" MUNICIPALITIES

The preceding data have been applied to test the following formal hypotheses:

That residents of municipalities characterized as "heavy non-resident borrowing" municipalities will tend to:

1) *have higher levels of completed formal education*
2) *have higher personal incomes, and*
3) *benefit from lower tax rates than residents of municipalities not so characterized.*

Further, that libraries in municipalities characterized as "heavy non-resident borrowing" municipalities will tend to:

4) *receive less income (per capita)*
5) *spend less for library materials (per capita)*
6) *have lower per capita circulation rates, and*
7) *have fewer graduate professionals on staff (per 10,000 population) than libraries in municipalities not so characterized.*

The diffused pattern of significant support for these hypotheses (p.141) underscores the local nature of the non-resident borrowing phenomenon.

Hypothesis No.	
3	Data support for a negative relationship between local tax levels and non-resident borrowing exists in 11 of 16 core areas. That is, *in 11 of the 16 core areas, municipalities whose residents may be characterized as heavy non-resident borrowers tend to have lower equalized tax rates than other municipalities in their core areas.*
1	Data support for a positive relationship between local educational levels and non-resident borrowing exists in 5 of the 16 core areas. That is, *in 5 of the 16 core areas, residents of heavy borrowing communities tend to have higher levels of completed formal education than residents of other municipalities in their core areas.*
2	Data support for a positive relationship between personal income levels and non-resident borrowing exists in 4 of 16 core areas. That is, *in 4 of the 16 core areas, residents of heavy borrowing communities tend to have higher personal income levels than residents of other municipalities in their core areas.*

Hypothesis No.

4 Data support for a negative relationship between library income per capita and non-resident borrowing exists in 4 of 16 core areas. That is, *in 4 of the 16 core areas, libraries in municipalities characterized as "heavy non-resident borrowers" tend to receive less income (per capita) than other libraries in their core areas.*

5 Data support for a negative relationship between library materials expenditures and non-resident borrowing exists in 3 of 16 core areas. That is, *in 3 of the 16 core areas, libraries in municipalities characterized as heavy non-resident borrowers tend to spend less (per capita) for library materials than other libraries in their core areas.*

6 Data support for a negative relationship between local circulation and non-resident borrowing exists in 2 of 16 core areas. That is, *in 2 of the 16 core areas, libraries in municipalities characterized as heavy non-resident borrowers tend to have lower local circulation rates than other libraries in the core area.*

However, data support for a positive relationship between local circulation and non-resident borrowing exists in 1 of the 16 core areas. That is, *in 1 of the 16 core areas, libraries in municipalities characterized as heavy non-resident borrowers tend to have higher circulation rates than other libraries in that core area.*

7 Data support for a negative relationship between staff professionalization and non-resident borrowing exists in only 1 of 16 core areas. That is, *in 1 of the 16 core areas, libraries in municipalities characterized as heavy non-resident borrowers tend to have fewer graduate professionals on staff (per 10,000 population) than other libraries in that core area.*

. . . . . .

Local Tax Effort (Hypothesis 3)

The equalized tax rate was included in the data primarily to determine its relationship with library income and expenditure indicators, with a view toward the eventual development of experimental "percentage equalized" grant distribution formulas based on local ability to pay for library services. The stated hypothesis represented no firm preconception with regard to the relationship between this indicator and non-resident borrowing. The relatively pervasive significance of this relationship was not anticipated, and--in truth--is not fully understood.*

*"Equalized Valuation" is the State Tax Commission's biennial estimate of the total "full-market value" of the taxable property wealth of each city and town. It is the determining factor in establishing state

Clearly, a relationship significant in 11 of 16 core areas cannot be dismissed as spurious or accidental. Clearly, also, we would not be justified in assigning definite causal properties to local tax effort without rigorous examination of such factors as

1) relationships between tax effort and socioeconomic characteristics,
2) tax collection levels,
3) the significance of locally generated revenues, etc.

The following is offered with these caveats in mind.

It appears to be true that, in 11 of 16 core areas, municipalities whose residents are characterized as heavy non-resident borrowers tend to enjoy substantially lower tax rates than municipalities not so characterized, and that a number of these communities could reasonably be expected to:

1) increase local tax rates (and library expenditures) if such increases would stimulate local use, or

2) contribute to the reimbursement of neighboring communities if increased local expenditures could not be expected to stimulate local use (by reason of the unapproachable excellence of neighboring facilities, accessibility factors, collateral use factors, etc.).

Socioeconomic Factors (Hypotheses 1 and 2)

In the Quincy, Wellesley and Worcester Core Areas, both the level of completed formal education and the personal income indicator correlate positively with non-resident borrowing. In the Fitchburg and Springfield Core Areas the educational level indicator correlates positively. In the Boston Core Area the personal income indicator correlates positively. In the Fitchburg, Springfield and Boston Core Areas the cognate indicator (educational level or income) approaches statistical significance. These 6 core areas account for approximately 60% of total core area use.

This, of course, does not support a final assignment of causal properties to these socioeconomic factors. We have no data to confirm that it is actually the better educated and more affluent residents of these communities that use extensively the resources of neighboring libraries. However, based on past research,

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school aid entitlements, one of the state aid formulas intended to equalize the distribution of financial assistance based on the municipalities' local funding capabilities.

it would be surprising if this were not the case.

We feel justified, therefore, in stating that, based on survey data and previous research findings, *there seems to be no justification for an assumption that, in the aggregate, the present free reciprocal option is of any substantial, demonstrable benefit to the socioeconomically disadvantaged.*

Library Support and Expenditure Indicators (Hypotheses 4 and 5)

These hypotheses were formulated to reflect preconceptions widely held by various segments of the library community; i.e., that use of extralocal public library facilities reflects inadequate local funding and inadequate local availability of current and recent library materials. It was anticipated that data application would indicate pervasive negative relationships between non-resident borrowing on one hand and library materials expenditures on the other. Such was not the case.

In only 4 of the 16 core areas can it be said that libraries in municipalities characterized as heavy non-resident borrowers receive less financial support than other libraries in their core areas.

Perhaps even more significantly, in only 3 of the 16 core areas can it be said that libraries in municipalities characterized as heavy non-resident borrowers tend to spend less for library materials than other libraries in their core areas.

These 3 core areas (Taunton, Pittsfield and Falmouth) contain approximately 8% of total state population, and are remarkably similar with respect to a number of characteristics.

RANK (HIGHEST TO LOWEST) OF 16 CORE AREAS

Core Area	Population Density	Non-Resident Transactions Per Capita	Per Capita Materials Expenditures	Heterogeneity Re Materials Expenditures
Taunton	11	4	15	4
Pittsfield	15	5	16	2
Falmouth	14	6	12	7

1) All are low population density areas, with a number of municipalities of under 10,000. In the Pittsfield Core Area, 50% are under 5,000 population. Major lending municipalities are considerably larger.

*For example, the 1975 Gallup survey, The Role of Libraries in America, confirms heavier than average non-resident use by college graduates, and business and professional people (tables 51,52).

2) Based on population, all are areas with considerable non-resident borrowing activity.

3) Materials expenditure figures are low, but

4) All are heterogeneous with respect to per capita expenditures for library materials.

Stated somewhat differently, these 3 core areas tend to confirm our preconceptions regarding materials expenditures and non-resident borrowing:

1) *In small communities certain diseconomies of insufficient scale preclude libraries from approaching basic self sufficiency in terms of current materials availability.*

2) *In areas where these diseconomies apply, residents of municipalities with low materials expenditure figures will seek out the resources of municipalities with more substantial expenditure commitments.*

However, this situation is atypical. In 13 of the 16 core areas there is no statistically significant relationship between non-resident borrowing and local expenditures for library materials.

Circulation (Hypothesis 6)

The negative relationship hypothesized reflects a preconception with regard to the relationship between non-resident borrowing and local borrowing: that heavy use of extralocal public library facilities would correlate with light use of local facilities; and that non-resident use, therefore, might be considered a transfer of workload from the local library to the extralocal library (this being the rationale for the "net plus loans" statistic used as the basis for reimbursement in several states). Data from only 2 of the 16 core areas (Taunton and Falmouth) would seem to support this concept.

A positive relationship might have been hypothesized, reflecting an equally logical preconception: that heavy use of extralocal public library facilities would correlate with heavy use of local facilities; i.e., that heavy library users faced with the reciprocal borrowing option would would tend to exercise that option to augment but not replace local library use. Data from only 1 of the 16 core areas (Worcester) would seem to support this concept.

Professionalization (Hypothesis 7)

The negative relationship hypothesized represents to firm conviction that heavy non-resident borrowing would prove to be significantly and pervasively related to low professional personnel commitments. "Professionalization" does not tend to stand alone as a variable with causal implications: it is inexorably linked with measures of income and expenditure.

In only 1 core area (Wellesley) does a systematic, statistically significant (though modest) relationship exist.

OBSERVATIONS AND RECOMMENDATIONS

SUGGESTIONS FOR FURTHER STUDY AND RESEARCH

OBSERVATIONS AND RECOMMENDATIONS

I. Non-Resident lending activity is impressive in total volume (approximately 2,000,000 loans per year) but represents only 5% to 6% of statewide public library circulation.

II. Although 288 municipalities reported non-resident loans during the sample year, the burden fell most heavily on relatively few municipalities:

--20 libraries accounted for 62% of all loans,

--10 of these libraries were regional or subregional headquarters libraries, and 1 had status as an intermediate reference center.

Therefore, it would seem that the non-resident borrowing options of the majority of public library users could be protected by appropriate reimbursements to relatively few municipalities.

III. Although the sampling methodology is undeniably appropriate for measuring total activity, determining and ranking in relative terms the heavy lenders and heavy borrowers, determining heavy activity areas, and, in general, producing planning data, the variability of the data for the lower population groups makes questionable the future use of sample projections for reimbursement purposes.*

Although past exigencies have forced the use of these data as the basis for LSCA grant distributions to heavy lenders, such use was not anticipated. The survey design was not prepared with a view toward establishing precise formulas for reimbursement based on the projection of sample volumes.

Accordingly, it is recommended that the Board not make future reimbursements based on projections of local data; but concentrate on the identification of obvious heavy lenders and the development of methods of reimbursement that will formalize and further encourage their services to extralocal clienteles.

IV. It would seem advisable for the Board of Library Commissioners to examine the continuing viability of reciprocal borrowing as a condition of eligibility for direct state aid, and give consideration to defining reciprocal borrowing as a condition of regional affiliation under Chapter 78, Section 19C, M.G.L.; and to providing therein a method of reimbursement to heavy lenders.

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*Tolerance figures on page 5 are extreme, in that seasonal variations were not considered. However, the reservations expressed above would still apply, particularly in lower population groups.

A. It is impossible to determine from data the extent to which direct non-resident borrowing is an alternative to recourse to the interlibrary loan process; i.e.,

--we do not know how often direct non-resident borrowing is suggested to the borrower by the local librarian as an alternative to interlibrary loan, and

--we do not know the extent to which voluntary use of a regional or subregional library is the result of the borrowers knowledge of the regional status of that library.

B. Therefore, the present statutory distinction between non-resident lending and reimburseable regional services is prejudicial to contracting libraries whose heavy non-resident loan volumes reflect their regional status.

C. There is little logic in requiring that libraries serve an extralocal population as a condition of eligibility for a per capita state grant based on local population. No other state aid grant has a comparable requirement.

D. Although state aid is contingent upon compliance with the several state-mandated standards, it is not intended to provide reimbursement for adherence to these standards. State aid is an incentive to local effort, and, by implication, is directed toward improvement of services to local populations.

E. On the other hand, regional funds are not incentives: they are intended to reimburse local contracting libraries for the costs of services actually rendered to extralocal populations. Recognition of non-resident lending as such a service is surely consistent with the purpose of the General Court in authorizing the regional systems.

F. Libraries giving substantial non-resident loan services, but not serving by contract as regional/subregional libraries, should be considered for such status, or offered contractual status as Regional Lending Centers whose responsibilities would be limited to direct loan services to non-residents. Reimbursement limits should be determined through the existing regional plan of service and budget mechanism.

1. In only one of the identified core areas (Marlborough) is there substantial interregional activity. In this instance, some apportionment of both Central and Eastern regional funds would be necessary.

G. The recognition of non-resident lending as a reimbursable regional program would add a new

dimension to regional services, and would strengthen the justification of requests for increased appropriations.

H. The "Agreements to Participate..." signed by all libraries receiving regional services should include the clause appearing in the "Agreements" in force in the Central Region:

In becoming a participant in the _____ Regional System the Library will have access to the services of the System and agrees to participate in any interlibrary loan and reciprocal borrowing plans that may be established for all the libraries in the System by the _____ Regional Advisory Council.

1. In other words, while major lending libraries, whether those loans be direct or interlibrary, are entitled to a reasonable compensation based on extraordinary volume, all libraries enjoying the benefits of regional services recognize a responsibility to participate in cooperative, reciprocal agreements.

V. The above is contingent upon additional funds for regional services. Unless additional funds are made available in the near future, the Board must consider the alternative of abandoning the concept of mandated free lending to non-residents, whether that mandate is a condition of state aid eligibility or a condition of regional affiliation.

A. The impact of reciprocal borrowing on the heavy lending libraries is too substantial to be mandated without reimbursement. Even the most sympathetic of librarians and library boards must be influenced by the economic and political liabilities incurred.

B. Examination of the core area activity matrices will indicate that there is very little quantitative reciprocity.

C. The prevailing characteristics of "heavy borrowing" municipalities (low tax rates, high socio-economic status), though not totally pervasive, indicate that a number of communities could well afford to reimburse neighboring heavy lenders under the authority of Chapter 78, Section 8; and that most individual heavy users might well be able to pay reasonable non-resident fees.

C. One caveat is in order, however: should a substantial percantage of current non-resident borrowings suddenly be translated into interlibrary loan requests, the results could be disasterous for the regional systems.

SUGGESTIONS FOR FURTHER STUDY AND RESEARCH

I. The purpose of this survey was defined, in part, as follows:

(To provide) raw data for the planning of resource sharing and other cooperative activities that would expand even further the access potential of library users.

Core area definition and analysis was undertaken with this purpose in mind.

A. Core area analysis reveals the essentially local nature of non-resident borrowing activity, as well as the widely divergent nature of areal characteristics.

B. Statistical analysis can go no further. Local librarians must make the final determination of causal factors, and determine the precise implications of these voluntary interaction patterns as far as potential cooperative activities are concerned.

C. The Board of Library Commissioners should support further feasibility studies of cooperative activities suggested by these interactions; and eventually support the implementation of such activities.

II. Regrettably, the present study could make no evaluations with regard to "accessibility" or "collateral use" factors affecting non-resident use. These may be defined as follows:

Accessibility Factors - The extent to which non-resident use is influenced by distance, building access, parking facilities, etc.

Collateral Use Factors - The extent to which non-resident library use is related to but secondary to a primary use; i.e., library use by persons who are working, shopping, going to school or seeking recreation in another community.

Accessibility factors are important in that, by and large, they operate independent of library quality or the lack thereof, with respect to both the borrowing and the lending communities

Collateral use factors are important in that they may bring to the lending community certain economic benefits which transcend non-resident lending costs and inconveniences.

Again, however, these are matters best investigated at local and area levels.

TECHNICAL APPENDIX

A. Projections

1. Confidence Interval

Projections of aggregate and municipal data are based on the following formula for the confidence interval for small samples, when the sampled universe is finite and known:

$$CI = \frac{\sigma}{\sqrt{Ns}} \cdot \sqrt{1 - \frac{Ns}{Nu}} \cdot t_{.05}$$

When

CI = Confidence interval (Expressed in measurement units. In this case, non-resident loans made during sampling periods)

σ = Standard deviation

Ns = Number of units in sample

Nu = Number of units in universe

$t_{.05}$ = Critical value of "t" statistic at .05 level of significance, with df (degrees of freedom) equal to Ns - 1.

2. Tolerance

In as much as the confidence intervals vary greatly according to the size of the sample means for the various municipalities, it is advisable to further express precision by way of a comparable statistic. A tolerance has been computed for each sample distribution, which expresses the confidence interval as a percentage of the sample mean; i.e.,

$$T = \frac{CI}{\bar{X}}$$

When

T = Tolerance

CI = Confidence Interval

$\overline{X}$ = Sample Mean

3. Low, High and Mean Projections

In projecting total volume from sample volume it is appropriate to make these projections in terms of the range of projected values defined by the confidence interval; which, in turn, is determined by the chosen level of significance (in this case, the .05 level): i.e.,

$$\text{Low Projection} = (\overline{X} - CI)Nu$$
$$\text{High Projection} = (\overline{X} + CI)Nu$$
$$\text{Mean Projection} = \overline{X} \cdot Nu$$

In narrative terms, we are 95% certain that the true total volume falls between the values for the low projection and the high projection.

The mean projection, however, remains the best available estimate of the true total volume and, in this study, has been used as the base for all further computations.

Example

The municipality of Springfield reported the following non-resident loans for the 8 sample periods:

Sample period	Loans reported
1 (12/13-12/19)	935
2 (1/31-2/6)	1,294
3 (3/21-3/27)	1,563
4 (5/9-5/15)	1,247
5 (6/27-7/3)	1,391
6 (8/15-8/21)	993
7 (10/3-10/9)	1,534
8 (11/21-11/27)	1,582
	Σ = 10,539

$\overline{X}$ = 1,317 σ = 250.6

Ns = 8 (weeks) Nu = 52 (weeks)

Therefore,

$$CI = \frac{\sigma}{\sqrt{Ns}} \sqrt{1 - \frac{Ns}{Nu}} \cdot t_{.05} = \frac{250.6}{2.828} \times .920 \times 2.365 = 193$$

$$I = \frac{CI}{\overline{X}} \quad \frac{193}{1,317} = 14.7\%$$

High Projection = $(\overline{X} + CI)Nu = (1,317 + 193)52 = 78,520$
Low Projection = $(\overline{X} - CI)Nu = (1,317 - 193)52 = 58,448$
Mean Projection = $\overline{X} \cdot Nu = 1,317 \times 52 = 68,484$

In narrative terms, the confidence interval represents a 14.7% deviation ($\pm$) from the sample mean. We are 95% certain that the total volume of non-resident loans for Springfield, for the 52 week period represened by the sample, falls somewhere between 58,448 and 78,520, with the best estimate being the mean projection of 68,484.

4. Seasonal Variations

For a number of municipalities the distribution of sample values suggests that seasonal variations are significant, and that projections should be adjusted accordingly.

Sample returns from the municipality of Plymouth provide a case in point:

Sample period	Loans reported
1 (12/13-12/19)	123
2 (1/31/2/6)	187
3 (3/21-3/27)	169
4 (5/9-5/15)	266
5 (6/27-7/3)	669
6 (8/15-8/21)	621
7 (10/3-10/9)	148
8 (11/21-11/27)	154
	Σ=2,337

$\overline{X}$ = 292 σ = 222.2
Ns = 8 (weeks) Nu = 52 (weeks)

Therefore

$$CI = \frac{\sigma}{\sqrt{Ns}} \sqrt{1 - \frac{Ns}{Nu}} \cdot t_{.05} = \frac{222.2}{2.828} \times .920 \times 2.365 = 176$$

$$T = \frac{CI}{\bar{X}} = \frac{176}{292} = 60.3\%$$

High Projection = $(\bar{X} + CI)Nu = (292 + 176)52 = 24,336$
Low Projection = $(\bar{X} - CI)Nu = (292 - 176)52 = 6,032$
Mean Projection = $\bar{X} \cdot Nu = 292 \times 52 = 15,184$

The confidence interval represents a deviation of 60.3% ($\pm$) from the sample mean. Clearly, this extreme variability is the result of high summer volume represented by the returns for periods 5 and 6, and adjustments should be made to reflect a more accurate measure of tolerance.

Returns, therefore, have been broken down into two groups and projected as follows:

a. Periods 5 and 6

	Mon	Tue	Wed	Thur	Fri	Sat	
Period 5	99	124	167	71	62	98	$\Sigma = 1290$
Period 6	126	67	143	125	147	65	

$\bar{X} = 107$ $\sigma = 36.7$
Ns = 12 (days) Nu = 78 (days; i.e., 13 6-day weeks represented by samples)

$t_{.05} = 1.960$

Therefore,

CI = 19 T = 17.8%

Projections: High = 9,828
Low = 6,864
Mean = 8,346

b. Periods 1, 2, 3, 4, 7, 8

$\bar{X} = 175$ $\sigma = 49.7$
Ns = 6 (weeks) Nu = 39 (weeks)

$t_{.05} = 2.571$

Therefore,

CI = 48 T = 27.4%

c. Combined projections for the 2 groups of samples would be as follows:

Sample Groups	High	Low	Mean
5 and 6	9,828	6,864	8,346
1,2,3,4,7,8	8,697	4,953	6,825
Totals	18,525	11,817	15,171

This translates into a tolerance of 22%, a much more realistic figure than that obtained without consideration of seasonal variation.

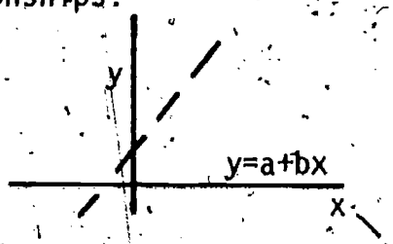
B. Population Group Analysis

The municipal library and finance data utilized in these computations are FY1977 data reported to the Board of Library Commissioners by the public libraries of Massachusetts.

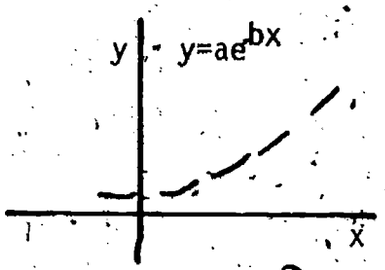
The following methodology was used in determining significant linear or curvilinear relationships between all possible data pairs.

1. Scatter plots of all data pairs for the purpose of identifying the probable nature of relationships.
2. All data entered into a programmable calculator, preprogrammed to provide regression and correlation coefficients for the following relationships:

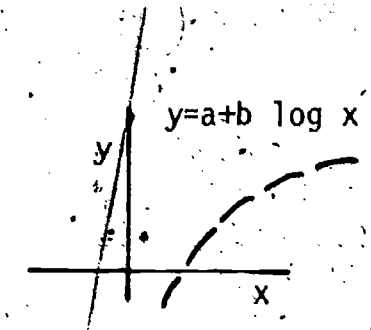
a. Linear Regression



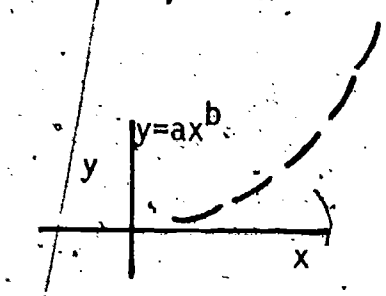
b Exponential Curve Fit



c. Logarithmic Curve Fit



d. Power Curve Fit



3. Determination of the statistical significance of yielded coefficients of correlation (r):

a. N (Number of pairs in data) of 30 or more: critical-ratio z-test

$$z = r\sqrt{N - 1}$$

If z is greater than ± 1.96, then r is significant of the .05 level.

b. N (Number of pairs in data) of less than 30: test by critical value of the t statistic

$$t = r\sqrt{\frac{N - 2}{1 - r^2}}$$

Significance determined by critical value of the t statistic with df (degrees of freedom) equal to N - 2

C. Core Area Analysis

In addition to the linear and curvilinear relationships described above:

1. Point-Biserial Correlation

In determining possible relationships between (1) the extent to which residents of municipalities used resources of the libraries of other municipalities (non-resident borrowing), and (2) various socioeconomic, library support and library activity indicators for the "user" communities, it seemed advisable to include, as a possible measure of statistical significance, a statistic that would indicate correlative relationships of a non-continuous nature.

$$r_{pb} = \frac{\bar{y}_1 - \bar{y}_0}{\sigma} \sqrt{\frac{N_1 \cdot N_0}{N(N - 1)}}$$

When

r_{pb} = point-biserial correlation coefficient

$\bar{y}_1$ = the mean of the values of the continuous variable for municipalities in dichotomous category 1

$\bar{y}_0$ = the mean of the values of the continuous variable for the municipalities in category 0

N_1 = number of municipalities in dichotomous category 1

N_0 = number of municipalities in dichotomous category 0

σ = standard deviation

$N = N_1 + N_0$

The dichotomous catagories are determined by whether a particular municipality, as a user of external facilities, exceeds or falls below the area-wide non-resident activity index.

The statistical significance of the point-biserial coefficient is determined by a t-test, with degrees of freedom (df) equal to N - 2:

$$t = r_{pb} \sqrt{\frac{N - 2}{1 - r_{pb}^2}}$$